ACE II

Advanced Cryogenic Electronics

USER'S MANUAL



HP-307
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HOFFER FLOW CONTROLS, INC.
Perfecting Measurement™
107 Kitty Hawk Lane • P.O. Box 2145 • Elizabeth City, North Carolina 27906-2145
1-800-628-4584 • (252) 331-1997 • FAX (252) 331-2886
www.hofferflow.com • Email: info@hofferflow.com

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FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting HOFFER FLOW CONTROLS:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

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1. P.O. number to cover the COST of the repair/calibration,
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This warranty shall not apply to any HFC goods or parts thereof, which have been repaired outside HFC's factory or altered in any way, or have been subject to misuse, negligence, or accident, or have not been operated in accordance with HFC's printed instructions or have been operated under conditions more severe than, or otherwise exceeding, those set forth in the specifications for such goods.

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Disclaimer

Specifications are subject to change without notice.
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Specifications

Environmental

Operating Temperature:	-20°C to 70°C
	-30°C to 70°C with optional heater
Storage Temperature:	-40°C to 85°C
Humidity:	0-95% Non-condensing

Approvals and Regulatory Compliance

State of California Department of Weights and Measures
Standards:
- AGA 7
- OIML Tc 8 Sc 7, R117, R118
- ISO 6551, 7637
- NIST Handbook 44, 3.37

CE
- Emissions EN55011
- Immunity EN61326

Enclosure

NEMA 4X
Optional Explosion Proof,

Power Supply

8 to 30 Volts DC, 400mA max
Optional 110/220 VAC, 50/60Hz, 250/500 mA

Display

128x64 graphical display
Easy scroll through list of up to 14 selectable process parameters
LED back light
Adjustable contrast

Keypad

3 soft keys + 2 arrow keys can be individually disabled

Optional Infra-Red Interface

Front panel infrared transmitter/receiver for remote operation and communication

Diagnostics

Multiple error messages
Failure detection for RTD and analog inputs
System configuration and diagnostics from a PC computer through RS-232 or IR port

Flow Compensation and Calculation Methods

5-point flow meter linearization
Up to 4 fluid properties tables

Security Features

Audit Trail with Time/Date/ID/New value/Old value for configuration changes

Flow Meter Input

Magnetic coil
Frequency range: 0.2 to 5,000 Hz.
Amplitude: 10mVrms to 50Vrms

Temperature Input

RTD selectable 100, 1000, 2500 Ohms
Accuracy 0.025%
Resolution 12 bit
Over voltage and over current protected

Analog Output

12 bit true D/A
Selectable 4-20mA, 1-5V

Pump Interlock Relay

240 Vac, 5A max.

RS232 Port

Printing or communication with a personal computer

Pressure Input

12 bit resolution
Selectable 4-20mA, 1-5V

Pulse Output

200 Hz max scaled to volume or mass units
0-5 V TTL, Open collector 30 Vdc, 250 mA max.

Clear Output

500mS pulse out
0-5 V TTL, Open collector 30 Vdc, 250 mA max.

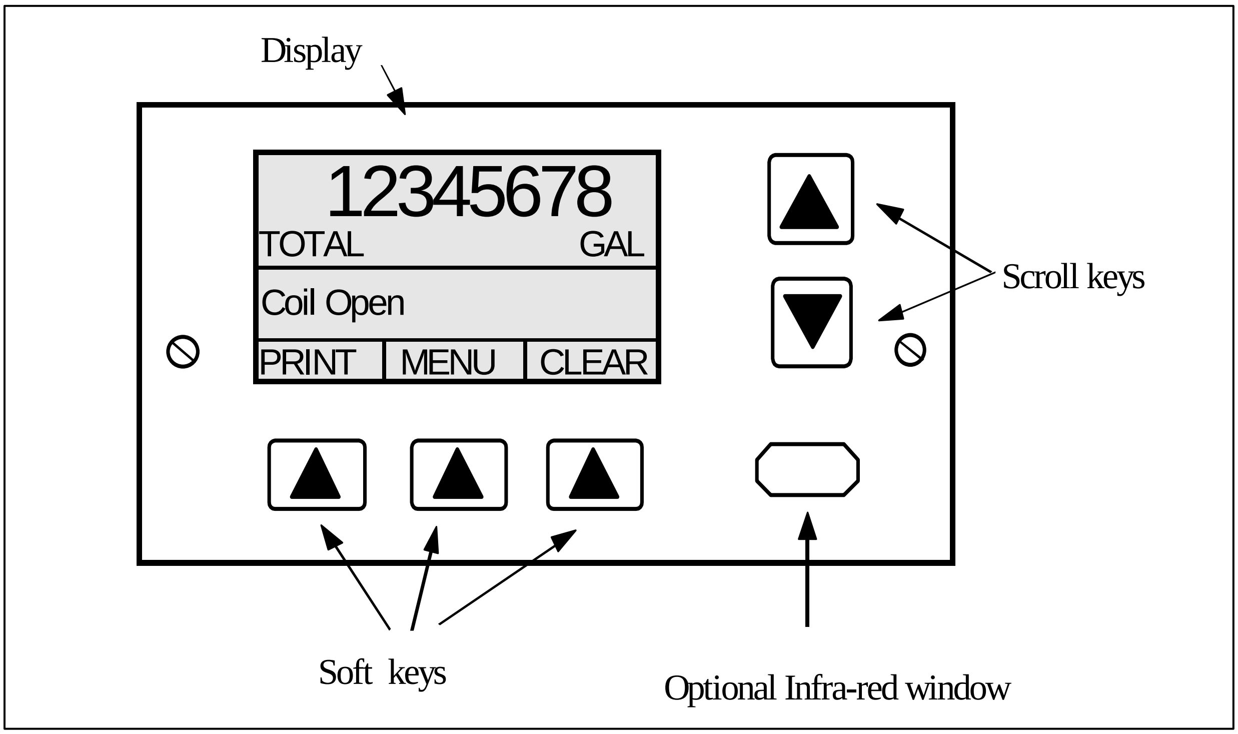
Pulse Security Input

Quadrature input for magnetic coil, ISO6551 level B compliant
Frequency range: 0.2 to 5,000 Hz.
Amplitude: 10mVrms to 50Vrms

Overview

System Description

The ACE II, Advanced Cryogenic Electronics, is a truck mounted flow metering system for delivery of cryogenic fluids. The system uses an internal computer to record and display deliveries in the required units. An optional printer allows the system to print delivery information and ACE II setup parameters. ACE has been designed to meet the requirements of the cryogenic metering section of NIST HANDBOOK 44 and OIML R-81. Typical ACE II system consists of a turbine flowmeter, flow computer, a metering run mounted on the delivery truck, and an optional printer.



ACE II Front Panel

Front Panel

The ACE II flow computer has a graphical display with 64x128 pixel resolution. The display is divided into three sections: the upper section displays delivery total and other delivery parameters, the center section displays error and custom messages, and the lower section displays labels for the three software-controlled keys (soft-keys).

Below the display are three soft-keys, which functions vary with the ACE II mode of operation. The soft-key labels, which are displayed above the keys, change according to the keys function. On the right side of the display are the Up and Down SCROLL keys. These keys are used to select display parameters, and to navigate through the configuration menu. Under the SCROLL keys is an infrared window for communicating with a computer equipped with a compatible Serial to IR adapter or for printing to a model P7 printer.

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Model Number

The ACE II model number is provided by the Hoffer sales department based on the type of flow meter pick up coils, hardware options installed, power supply, enclosure type, and accessories supplied with a unit.

ACEII-(1T)-(P)-(7)-(PS)-(12)-(H)-(S)-(SP)

SERVICE

Volumetric Products

(1) LIN/LOX/LAR
(2) CO2
(3) Nitrous Oxide
(4) Liquid Hydrogen
(5) LPG
(6) LNG
(7) (LIN/LNG/Ethylene
(V) Volumetric
(X) None

Temperature/Pressure Compensation and RTD inputs

(T) Add **T** after the number of the above product for temperature compensation
(P) Add **P** after the number of all the products for pressure compensation
(TP) Add **TP** after the number of products for both temperature and pressure

PUMP INTERLOCK

(PI) 240 VAC, IMAX 5 AMPS
(X) None

OUTPUT OPTION

Scaled Pulse or Analog Output

(1) Open Collector
(2) TTL/CMOS
(7) 4-20mA output
(8) 1-5Vdc output
(X) None

PULSE SECURITY INPUT (PTB) OPTIONAL

(PS) Quadrature Input per ISO6551 level B complaint (requires second mag coil on turbine)
(X) None

POWER INPUT

(12) 12Vdc power input, 12 Vdc battery input
(24) 24Vdc power input, 24 Vdc battery input
(AC) 110/220 VAC input, 24Vdc power output

HEATERS OPTIONAL

(H) Heater required for below 32°f
(X) No heater required

ENCLOSURE STYLE

(S) Standard-flat mount with shocks
(T) Tilt bracket with shocks
(E) Explosion-Proof with 5 switches on cover

SPECIAL FEATURES

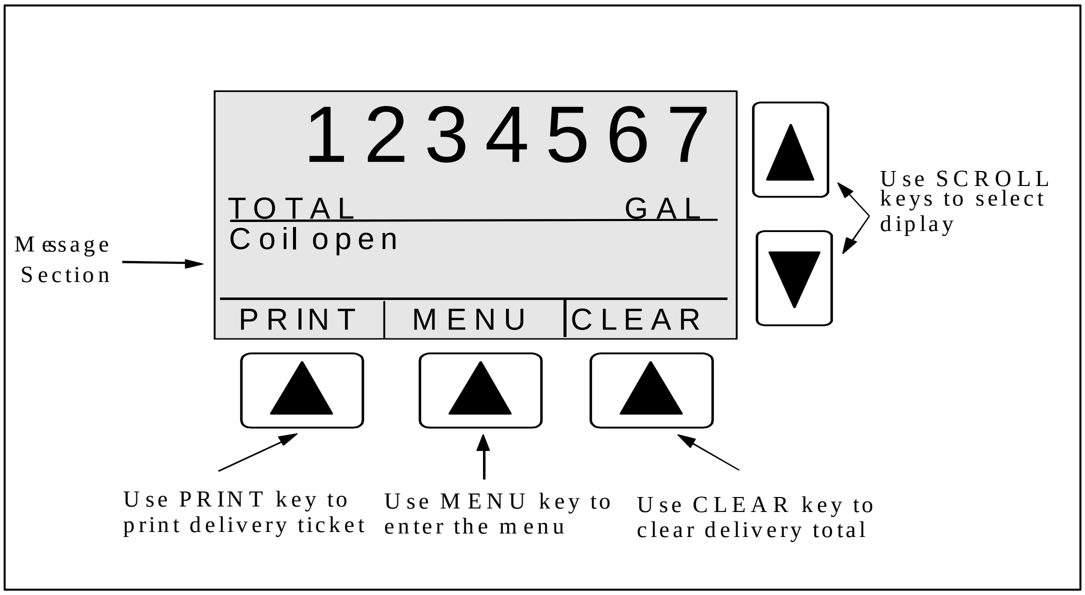
(SP) Any special features that are not covered in the model number
(W) Windows, based RS-232 serial port configuration program with adapter and cable

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Operation

NOTE: This section applies only to ACE II units that have already been programmed. For initial programming and set up refer to the Menu Structure section of this manual.

Front Panel Operation



Display parameters

The following process parameters are available for display and may be selected using the Windows Configuration Program. Refer to the chapter on the WinConfig Program for more information on setting the display parameters.

Parameter	Display	Description
Frequency	FREQ	Measured input frequency from turbine meter.
V/Rate	RATE	Flow rate, compensated to a selected reference condition, expressed in units of volume.
U/Rate	U/RATE	Uncompensated flow rate, expressed in units of volume.
V/Total	TOTAL	Compensated total, corrected to a selected reference condition, expressed in units of volume. ACEII always defaults to the total selected in Delivery Units.
U/Total	U/TOTAL	Uncompensated total, expressed in units of volume.
M/Rate	RATE	Compensated flow rate based on fluid density, expressed in units of mass.
M/Total	TOTAL	Compensated total based on fluid density, expressed in units of mass. ACEII always defaults to the total selected in Delivery Units.
M/Acc Total	ACTOT	Accumulated compensated total expressed in units of mass.
V/Acc Total	ACTOT	Accumulated compensated total expressed in units of volume.
U/Acc Total	U/ACTOT	Accumulated uncompensated total, expressed in units of volume.
Temp	TEMP	Measured flowing temperature. It will display a programmed default temperature when default temperature is being used for compensation, or "N/A" when temperature is not selected for compensation.
Press	PRES	Measured flowing pressure. It will display a programmed default pressure whenever the default pressure is being used for calculation, or "N/A" when pressure is not selected for compensation.
Dens	DENS	Measured flowing density. It will display a programmed default density whenever the default density is being used for calculation, or "N/A" when density is not selected for compensation.
Date and time	DATE	Current Date and Time

Contrast Adjust

Display contrast can be adjusted using the SCROLL keys during the first 15 seconds after power up. A message is displayed while the adjustment period is active. After the contrast adjustment period, the SCROLL keys are used to select display parameters or to navigate in the program menu.

Displaying Base Conditions

To display current Base/Reference Conditions press MENU key, scroll to item number 5 (Base Conditions) using the SCROLL key, and then press SELECT key.

Displaying Software Version

The software version number is displayed each time the ACE II is powered up.

Printing

Press the PRINT key to print a delivery ticket. A message will be displayed to ready printer. Press OK to print delivery ticket. To select other items for printing press the MORE key. Select a desired item for printing using SCROLL keys, and press the SELECT key. The printing function is available while flow is present.

ACE II detects when the printer is not connected, off line, or out of paper and displays a warning message.

Print Menu:
- Ticket
- Trip report
- Error Log
- Configuration data
- Audit Trail

NOTE: To print to a Model P7 printer via the IR port, Print Enable must be set to Infrared in the Utility Functions Menu.

Ticket Asterisks

Asterisks enclose the delivery total on all valid delivery tickets. If the feature is turned on, asterisks will be removed from the delivery ticket if any of the selected errors occur during the delivery, and exceeds the set accumulated error time. The errors can be viewed and selected in the Program/ System Configuration/ Utility Functions menu and the ACE menu in the WinConfig program. Asterisks are always removed when the delivery total does not reach the Minimum Delivery for a given meter size.

Trip Report

Trip Report registers stores up to 100 trip reports containing delivery information, and may be selected form the Print menu.

Error Log

Error conditions are recorded in the error log. The error log can be printed; it cannot be viewed on the display.

Audit Trail

Audit Trail records changes made to ACE II that affect the Delivery Total. Each record consists of sequential number, date, time, user ID, description of the field being changed, old value, and new value. The Audit Trail stores up to 1000 records. The records of the audit trail can be printed. A message prompts user to enter the number of records to be printed.

Clearing

To clear a delivery total press the CLEAR key. A message “Are you sure” will be displayed. Press YES key to confirm clearing. After pressing the YES key to confirm, information stored in the register will be lost. Press MORE key to select additional items for clearing.

Clear Menu:
- Total
- Accumulated Total
- Trip #

Clearing is not available while flow is present. A warning message will be displayed when the CLEAR key is pressed while flow is present.

Auto Clear Feature

After printing a delivery ticket, ACE II automatically clears the delivery total when the next delivery begins. Auto Clear feature is always active.

Error and Custom Messages

There are a number of warnings and error messages that guide the user in the event of an operational problem or conflict in the configuration parameters. When error conditions occur an error message is displayed in the message section of the display. If more then two error conditions occur simultaneously, the messages automatically scroll every three seconds. Refer to Appendix D for a list of error messages.

The message section can be used to display custom messages including fluid name, base conditions, compensation range. For further information on composing custom messages refer to the WinConfig section of this manual. A custom message is replaced by an error message when error conditions occur.

Errors are recorded in the ACE II error log for future printing.

Passwords

The ACE II has two levels of password protection: operator and supervisor. At each level there are five user ID numbers available. Any configuration parameter that may affect the flow calculation is protected with the supervisor password. Operator password allows clearing of Accumulated totals only. The unit is shipped unprotected, with all passwords set at 0000.

Diagnostics

To enter the diagnostic mode press MENU key, and select DIAGNOSTICS. Refer to Diagnostics section of this manual for further information about the diagnostics functions.

One-Minute Start Phase

During the first minute of operation, errors are displayed but are not recorded in the error log. This One-Minute Start Phase begins with the first indication that flow is present.

Pump Interlock Option

Pump Interlock is an optional feature that disables the pump when gas phase is detected in the meter run.

ACE II uses a Pump Cool Down Timer and Gas Detection feature to enable or disable the Pump Relay. If the Pump Interlock Option is selected, the temperature must drop below the Temperature Setpoint and liquid must be present at the pump before the relay will be enabled. When using default temperature method, the value assigned as the default temperature must be below the Temperature Setpoint for cool down to begin.

When the operating temperature drops below the programmed Setpoint value and liquid is detected, the Pump Cooling Timer is displayed in the Message Window which indicates "Pump Cooling Down *mm : ss* ". This timer counts down from the programmed Delay Time value, enabling the Pump Relay when reaching zero. ACEII will not totalize and errors will not be recorded until the temperature has dropped below the Setpoint and the Pump Cooling Timer has reached 0. A Delay Time value of 0 disables the Pump Cooling Timer.

If at any time during the process gas is detected, the pump will be inhibited. This also applies to the One-Minute Start Phase. After the phase condition returns to a liquid state, ACE II will enable the Pump Interlock Relay.

There is a list of errors available to be selected for Pump Deactivation. The Pump relay is inhibited if selected errors exceed the programmed accumulated error time. The Accumulated Error Timer does not begin until the One-Minute Start Phase has concluded. The errors are as follows:

Min Flow Error (50% of Min Flow Limit)
Max Flow Error
Pressure Signal Lost
Gas Inhibit
Compensation Range Error
Probe Short Error
Probe Open Error
Coil Short Error
Coil Open Error

Pump Service Timer

The pump service timer feature is designed to help with pump preventive maintenance schedule. When pump is serviced or installed the user enters the service date, the type of service and the maximum number of pump operational hours before the next service. ACE II will accumulate and display the total number of actual pump operational hours. If the number of operational hours exceeds the set number of Max Operate Hours an error message will be displayed. The error message will stay on until the actual hours display is reset to zero.

Pulse Security

ACEII provides an ISO6551 level B compliant quadrature input for pulse security. Error Detect must be turned on in the FLOWMETER Menu under I/O CONFIGURATION for pulse security to be active. “Pulse Frequency Error” will be displayed when an irregularity is detected on the input signal.

A dedicated input register is provided to count missing or double pulses deemed as “bad pulses”. The % of Total During Error field in the UTILITY FUNCTIONS menu under SYSTEM CONFIGURATION is used to set the maximum allowable error based on a percentage of the delivery total. If this limit is exceeded at anytime during the delivery, “Bad Pulse Limit Exceeded” will be displayed in the message window. If the message is displayed at the end of the delivery, the error will be reported in the error log and ticket asterisks will be removed from the delivery ticket if this feature has been enabled. If the pump interlock option is enabled, “bad pulses” are not counted until the temperature has dropped below the Temperature Setpoint and the Pump Cooling Timer has reached 0.

CO_2 Delivery

ACE II systems specified for CO2 service are equipped with a CO2 Single Pipe Fluid table and CO2 Dual Pipe Fluid table. The following describes in what manner each should be used.

SINGLE PIPE: The SINGLE hose delivery counts all product delivered through the meter on the totalizer. No correction is made for a vapor return or vapor balance line.

DUAL PIPE: A DUAL hose delivery occurs when a vapor return or vapor balance line is used in conjunction with the liquid delivery line. When the DUAL pipe method is selected, the totalizer automatically deducts the displaced vapor from the delivered total.

Net Accumulated Total

The net accumulated total is a difference between accumulated total after previous delivery and accumulated total after current delivery. The net accumulated total represents amount of fluid lost during cool down cycle. The net accumulated total is printed on the trip report.

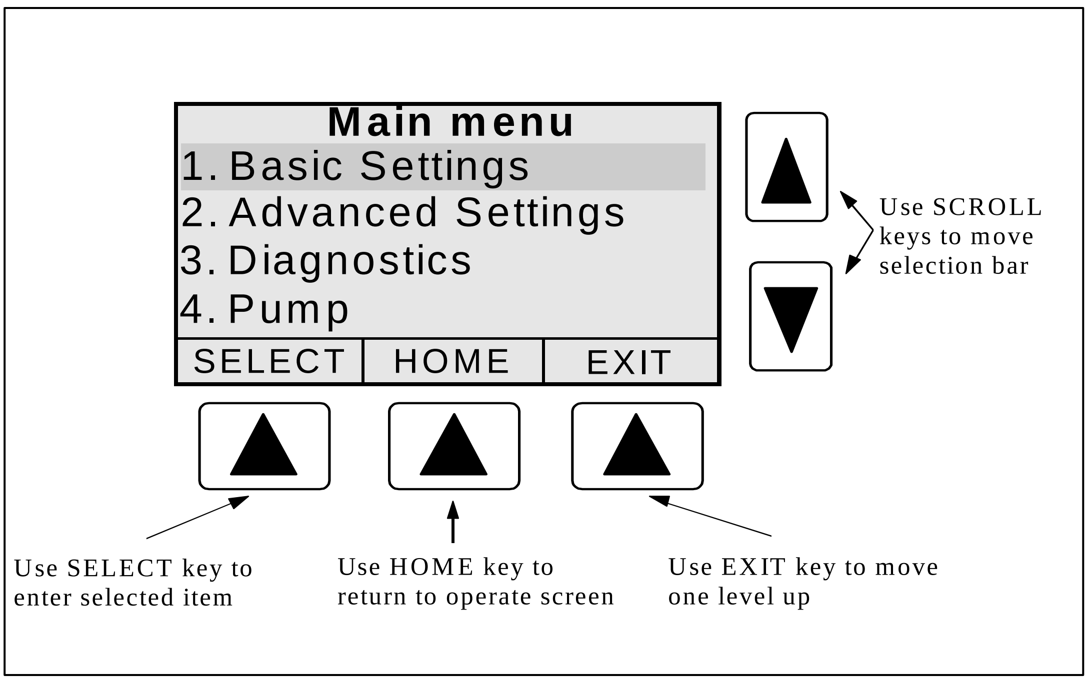
NET ACCUM TOTAL =(ACCUM TOTAL AFTER PREVIOUS DELIVERY) – (ACCUM TOTAL AFTER CURRENT DELIVERY)

Programming

The ACE II unit is shipped from the factory fully programmed per user specification; however, it is recommended to verify the program settings before installing the unit. Programming may be performed from the ACE II front panel, or from a personal computer using Hoffer configuration software. Connection to a personal computer may be established through the RS232 serial cable, or by using the infrared interface.

The program menu may not be entered while flow is present. This prevents parameters affecting the flow calculations to be changed during a delivery.

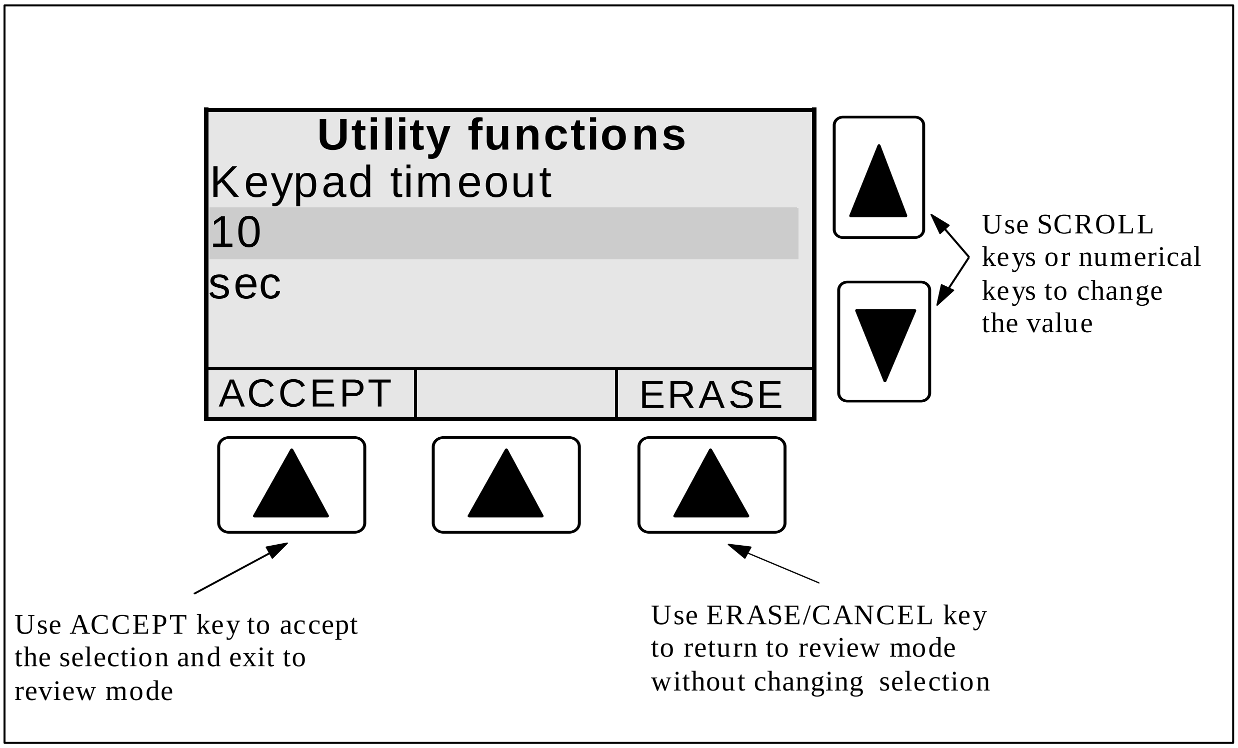
To enter the program mode press MENU key, and select Basic Settings or Advanced Settings. Software versions 1.00.6300 and later contain a Basic Settings Menu which has all of the most frequently used programming fields in a single top-level menu. The Advanced Settings menu is a multi-layer matrix of submenus and contains some of the least frequently needed menu items. Refer to the Menu Structure section for a detailed explanation of each programming field and a chart to assist in navigating through the menu to locate a desired menu item.



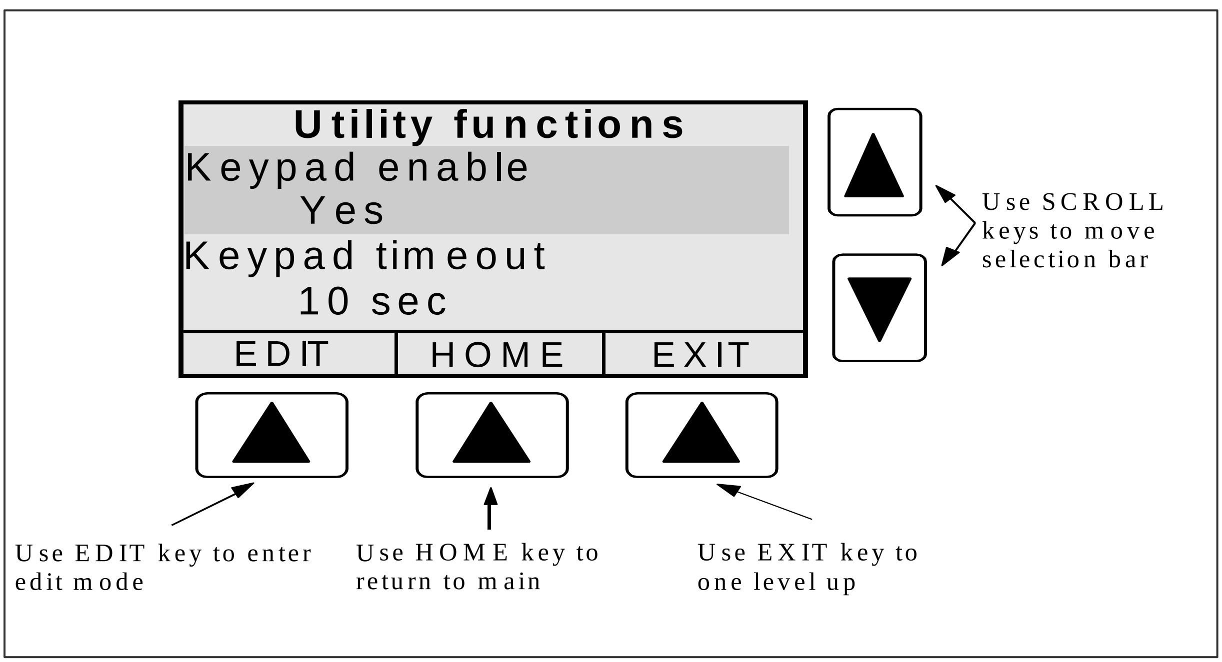
Main menu screen

Reviewing Settings

Program settings are displayed at the lowest level of the program menu. Once a menu item is selected, its value or setting can be changed using the EDIT key.



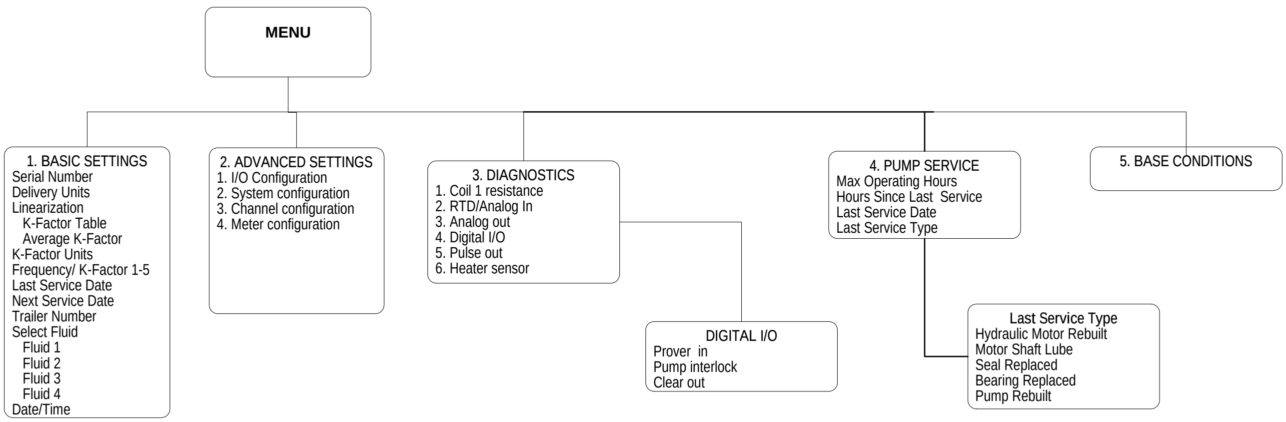
Editing Program Settings

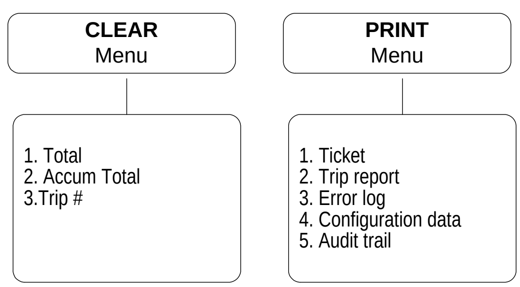


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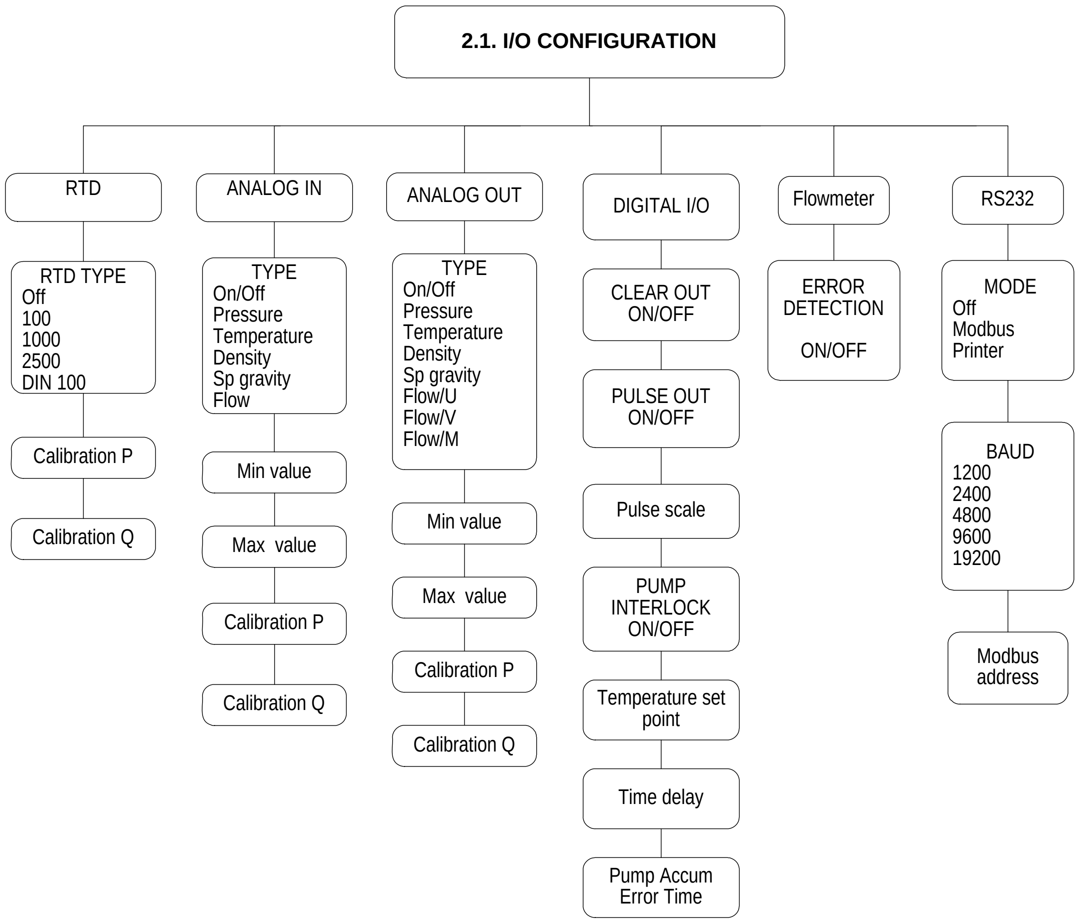
Menu Structure

The menu structure varies depending on options installed and configuration of the ACE II unit. Not all of the menu items described in this manual may be available on all units.

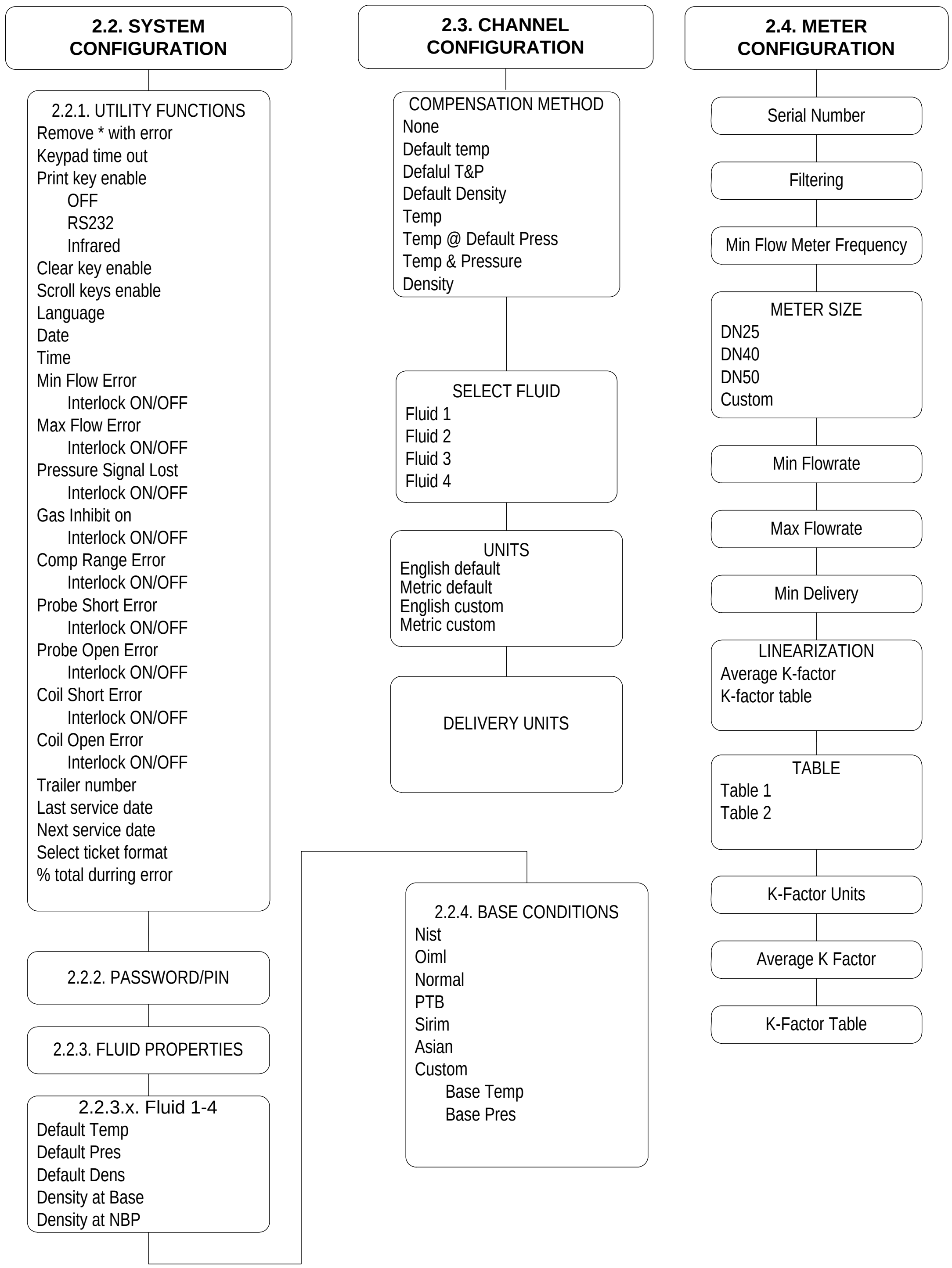




Advanced Settings Menu



Advanced Settings Menu



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Menu Fields

This section describes the program menu fields in detail. Whenever applicable the description is presented in the following format:

Menu Item	Selection	Comments

Paragraph numbers in this chapter correspond to the menu field numbers in the ACE II.

A program menu item can be accessed by pressing the MENU key and then using SCROLL and SELECT keys as described in the Operation section of this manual.

Basic Settings

Software versions 1.00.6300 and later have a Basic Settings Menu containing the most frequently used Program fields in an easy to access top-level menu.

1. BASIC SETTINGS

Menu	*Selection*	*Comments*
Serial Number	Number	Enter the Flowmeter serial number. Alphanumeric entries can be made from WinConfig, but cannot be edited from the instrument.
Delivery Units	***English Units*** Gallons @ NBP FT3 @ NTP LBS ***Metric Units*** Liters @ NBP M3 @ NTP KG	Select the default units displayed for Delivery Total. English / Metric units are available based on the type of units selected in the Channel Configuration in the Advanced Settings Menu.
Linearization	Average K K-Factor Table	Select whether a single Average K-Factor is used or a 5-point table of K-Factors over the flowmeters operating range.
K-factor units	Pulse / Gallon Pulse / Liter Pulse / FT3 Pulse / M3	Select units of measure for K-factor.
Average K-factor	Number	This menu is displayed when Average K-factor selected for linearization method. Enter a K-factor for the meter connected to this channel.
Last Service	Date	Enter the last service date.
Next Service	Date	Enter the next service date.
Trailer number	Number	Enter trailer number. Alphanumeric entries can be made from WinConfig, but cannot be edited from the instrument.

Menu	*Selection*	*Comments*
Select fluid	Fluid 1 Fluid 2 Fluid 3 Fluid 4	Select a fluid table for the current application. Up to four different fluids can be programmed in the ACE II. Actual Fluid names will be displayed in this menu if service was specified at the time or order.
Date/Time	Enter date and time	This menu is used to set time and date.

2. ADVANCED SETTINGS

1. I/O Configuration

1.1. RTD

Menu item	*Selection*	*Comments*
RTD Type	Off 100 1000 2500 DIN	Select a type of RTD probe. 100, 1000, 2500 are platinum 3902 material DIN is 100 Ohm platinum 0385 material
Calibration P	Number	See calibration procedure
Calibration Q	Number	See calibration procedure

1.2. Analog Input

Menu item	*Selection*	*Comments*
Function	Off Pressure Temperature Density Sp gravity Flow	Select a desired function for the analog input.
Min value	Number	Enter a number corresponding to the minimum value for the input range, in the units selected for the input.
Max value	Number	Enter a number corresponding to the maximum value for the input range, in the units selected for the input
Calibration P	Number	See calibration procedure
Calibration Q	Number	See calibration procedure

1.3. Analog Output

Menu item	*Selection*	*Comments*
Function	Off Pressure Temperature Density Sp gravity Flow/M Flow/V Flow/U	Select a desired function for the analog output.
Min value	Number	Enter a number corresponding to the minimum value for the analog output range.
Max value	Number	Enter a number corresponding to the maximum value for the analog output range.
Calibration P	Number	See calibration procedure.
Calibration Q	Number	See calibration procedure.

1.4. Digital I/O

Menu item	*Selection*	*Comments*
Clear out	ON OFF	Select “ON” to enable the Clear Out function.
Pulse Out	Off Pulse/U Pulse/V Pulse/M	Select a desired function for the Pulse Out.
Pulse Out Scale	Number	Enter a scaling factor for pulse out. “1” means one pulse is output for each unit of measure.
Pump Interlock	ON OFF	Select “ON” to enable the Pump Interlock function.
Temp Set Point	Number	Enter a temperature set point to be reached during cool down cycle, before the timer starts counting.
Time Delay	Number	Enter a time delay in seconds before pump relay is enabled after reaching the temperature set point.
Pump Error Time	Number	Enter Pump accumulated error time in seconds. Refer to WinConfig program for a selection of errors for Pump Interlock function.

1.5. Flowmeter

Menu item	*Selection*	*Comments*
Error Detect	ON OFF	Select “ON” to enable the pulse error detection function. This function is available for dual coil meters only.

1.6. RS232 Port

Menu item	*Selection*	*Comments*
Mode	Off Modbus Printer	Select Modbus for communication with a PC computer or Modbus master. Select Printer for printing function.
Baud	1200 2400 4800 9600 19200	Select a desired baud rate.

2. System Configuration

2.1. Utility Functions

Menu item	*Selection*	*Comments*
Remove* with error	Yes No	Select “Yes” to remove asterisks with selected errors.
Keypad time out	Enter a number of seconds Range: 0-	If the unit is left in the program mode, it will switch back to the operate mode when limit is reached. Zero means the time out function is disabled.
Print key enable	Off RS232 Infrared	If “No” is selected the front panel Print key is disabled. To enable, press any key and enter a password when prompted.
Clear key enable	Yes No	If “No” is selected the front panel Clear key is disabled. To enable, press any key and enter a password when prompted.
Scroll Keys enable	Yes No	If “No” is selected the front panel Scroll keys is disabled. To enable, press any key and enter a password when prompted.
Language	English Spanish Portuguese	Select a desired language.
Date Format	mm/dd/yy dd/mm/yy	Select a desired date format.
Date/Time	Enter date and time	This menu is used to set time and date. Also available in Basic Settings.

Menu item	*Selection*	*Comments*
Minimum Flow Error Maximum Flow Error Pressure Signal Lost Gas Inhibit Error Compensation Range Error Probe Short Error Probe Open Error Coil Short Error Coil Open Error	On/Off	Pump Interlock on / Pump Interlock off.
Trailer number	Number	Enter trailer number. Also available in Basic Settings.
Last service date	Date	Enter the last service date. Also available in Basic Settings.
Next service date	Date	Enter the next service date. Also available in Basic Settings.
Ticket format	Ticket 1 Ticket 2	Select a ticket format for printed tickets.
% total error	Number	Enter allowable percentage of error for pulse security function (pulse error detect).

2.2. Password/Pin

Menu item	*Selection*	*Comments*
Supervisor pin #1-5	Number	Enter a 4 digit for each supervisor pin number.
Reenter password	Number	Enter the supervisor password again to confirm.
Supervisor password	Number	Enter a 4 digit for supervisor password.
Operator pin #1-5	Number	Enter a 4 digit for each operator pin number.
Operator password	Number	Enter a 4 digit for operator password.
Reenter password	Number	Enter the operator password again to confirm.

2.3. Fluid Properties

Fluid 1

Menu item	*Selection*	*Comments*
Default Temperature	Number	Default temperature for Fluid 1.
Default Pressure	Number	Default pressure for Fluid 1.
Default Density	Number	Default density for Fluid 1.
Density at Base	Number	Density at reference temperature for Fluid 1.
Density at NBP	Number	Density at the normal boiling point for Fluid 1.

Fluid 2

Menu item	Selection	Comments
Default Temperature	Number	Default temperature for Fluid 2.
Default Pressure	Number	Default pressure for Fluid 2.
Default Density	Number	Default density for Fluid 2.
Density at Base	Number	Density at reference temperature for Fluid 2.
Density at NBP	Number	Density at the normal boiling point for Fluid 2.

Fluid 3

Menu item	Selection	Comments
Default Temperature	Number	Default temperature for Fluid 3.
Default Pressure	Number	Default pressure for Fluid 3.
Default Density	Number	Default density for Fluid 3.
Density at Base	Number	Density at reference temperature for Fluid 3.
Density at NBP	Number	Density at the normal boiling point for Fluid 3.

Fluid 4

Menu item	Selection	Comments
Default Temperature	Number	Default temperature for Fluid 4.
Default Pressure	Number	Default pressure for Fluid 4.
Default Density	Number	Default density for Fluid 4.
Density at Base	Number	Density at reference temperature for Fluid 4.
Density at NBP	Number	Density at the normal boiling point for Fluid 4.

2.4. Base Conditions

Menu item	Selection	Comments
Base conditions	NIST OIML NORMAL PTB SIRIM ASIAN CUSTOM	Select a predefined set of base conditions, or select “custom” to enter user defined base conditions. Base conditions are used to calculate corrected volume.

3. Channel Configuration

Menu item	Selection	Comments
Compensation method	Default temperature Default T&P Temperature Temp & Default P T&P Density	Select an appropriate compensation method. For T, P, D compensation an associated sensor has to be connected and an analog input has to be programmed accordingly. When a sensor fails, the default value is used for calculations.
Select fluid	Fluid 1 Fluid 2 Fluid 3 Fluid 4	Select a fluid table for the current application. Up to four different fluids can be programmed in the ACE II. Actual Fluid names will be displayed in this menu if service was specified at the time or order. Also available in Basic Settings.
Units	English default English custom Metric default Metric custom	Select a desired set of units of measure. For a complete list of available units and conversion factors refer to Appendix B.

4. Meter Configuration

Menu item	Selection	Comments
On/off	On Off	"On" has to be selected to activate the flow channel operation.
Serial number	Number	Enter up to a 10- digit flow meter serial number. Also available in Basic Settings.
Filtering	Number (0-100)	Enter a whole number between 0 and 100. This number represents the amount of filtering applied to the input signal coming from a meter. Default value is 0.
Minimum meter frequency	Number	Enter a frequency in Hz that is below an operating range of input frequency. Any signal at frequency below the Minimum value is considered "noise" and it will be rejected. Default value is 0.
Meter size	DN25 DN40 DN50 Custom	Select meter size installed in the ACE II system.
Min Flow rate	Number	Enter Min Flow rate value for custom size meter.
Max Flow rate	Number	Enter Max Flow rate value for custom size meter.
Min Delivery	Number	Enter Min Delivery value for custom size meter.
Linearization	Average K-factor K-factor table	Select an applicable method. The menus below will be displayed only when the associated method is selected. Also available in Basic Settings.
Table	Table 1 Table 2	Select K-Factor Table 1 or Table 2 to use for linearization. Multiple tables allow for easy switching between two different turbine meters.
K-factor units		Select units of measure for K-factor. Also available in Basic Settings.
Average K-factor	Number	This menu is displayed when Average K-factor selected for linearization method. Enter a K-factor for the meter connected to this channel. Also available in Basic Settings.

Flowmeter Size Selection

ACE II provides Flowmeter Size Selection in the Meter Menu to set values for Minimum Flowrate, Maximum Flowrate, and Minimum Delivery. The following table lists the meter size options and the corresponding parameters.

FLOWMETER SIZE	MIN FLOWRATE L/min (gal/min)	MAX FLOWRATE L/min (gal/min)	MIN DELIVERY Kg (lbs)
DN25	46 (12.152)	230 (60.760)	10 (22.046)
DN40	100 (26.417)	500 (132.086)	100 (220)
DN50	170 (44.909)	850 (224.546)	100 (220)
CUSTOM	User Defined	User Defined	User Defined

ACEII / PROVER Users

> ***NOTE:*** *Hoffer Flow Controls recommends programming the ACEII with a 5-point K-Factor table as calculated by the prover calibration and indicated on the Final Calibration Report printout.*

After all 5 prover calibration points have been calculated, the new K/M-FACTOR must be entered into the ACEII from the METER CONFIGURATION menu using the following procedure.

1. Press MENU
2. Select BASIC SETTINGS
3. SCROLL down to LINEARIZATION and press EDIT
4. Select K-FACTOR TABLE and press ACCEPT
5. SCROLL down to TBL1 POINT #1 – FREQ
6. EDIT TBL1 POINT #1 – FREQ and enter point #1 Freq from the Final Calibration Report printout
7. Press ACCEPT
8. EDIT TBL1 POINT #1 – FACTOR and enter point #1 K-Factor from the Final Calibration Report printout
9. Press ACCEPT
10. Continue entering the calibration data in this manner until all 5 points have been entered
11. Press HOME
12. Select YES at Save Data prompt
13. Select RESET at Reset prompt

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Diagnostics

Diagnostics Menu

ACE II provides diagnostic functions for testing Inputs and Outputs to verify hardware functionality. To access Diagnostics functions press MENU, scroll to Diagnostics, and press SELECT.

Diagnostics functions:

- Coil Resistance
- RTD/Analog In
- Analog Out
- Digital I/O
- Pulse Out
- Heater Sensor

Coil Resistance

The coil resistance diagnostic displays the resistance measurement (± 10 %) of the flowmeter pickup coil in Ohms. Normal coil resistance should be in the range of 1500 – 2500 Ohms.

RTD/ Analog Input

RTD and Analog diagnostic screen displays the A/D (analog to digital converter) counts for both the RTD input and the Analog Input (AI). A/D counts for a configured input should always be between 0 and 4095 during normal operation. As the transmitter signal increases, the number of A/D counts should also increase. As the RTD temperature increases, the number of A/D counts should also increase. If the count displayed is 0 or 4095, it means that either the input has not been configured or calibrated, or there is an RTD or Transmitter failure.

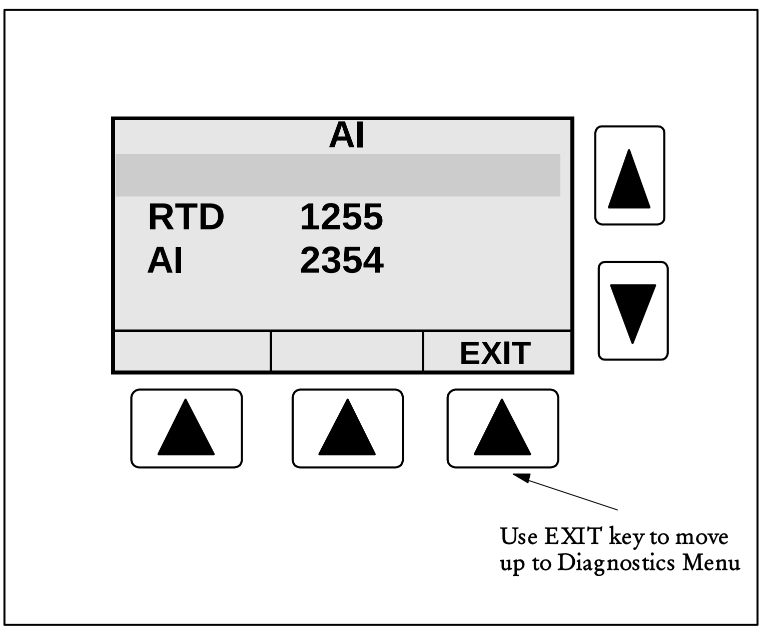


Figure 2. RTD/Analog Input Diagnostics Screen

Analog Output

The Analog Output may be tested by connecting a milliamp meter, to pins A and B of the analog output connector located on the ACE II rear panel. Pressing the SELECT key selects the output. Use the SCROLL keys to increase or decrease the number of D/A counts. As the number increases, the output current should increase. As the number decreases, the output current should decrease. The range of D/A counts is from 0 to 4095. At 0 counts the output current should be close to 4 mA; at 4095 the current should be close to 20 mA.

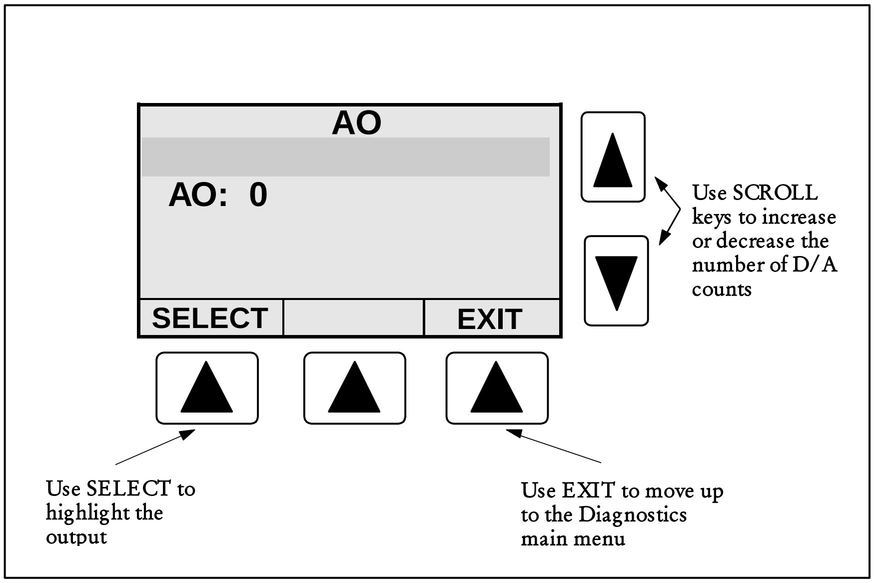


Figure 3. Analog Output Diagnostics Screen.

Digital I/O

The Digital I/O diagnostics is used to verify operation of the digital inputs and outputs. The state of the Prover input is displayed as a 1 or a 0. A 1 represents a high signal level and 0 a low signal level. When a signal is applied to an input, the corresponding digit will toggle accordingly. For the Pump Interlock and Clear Outputs, press SELECT to highlight the desired output and use the SCROLL keys to toggle the output between high and low levels. The output may be monitored with a meter connected to the corresponding output connector on the ACE II rear panel.

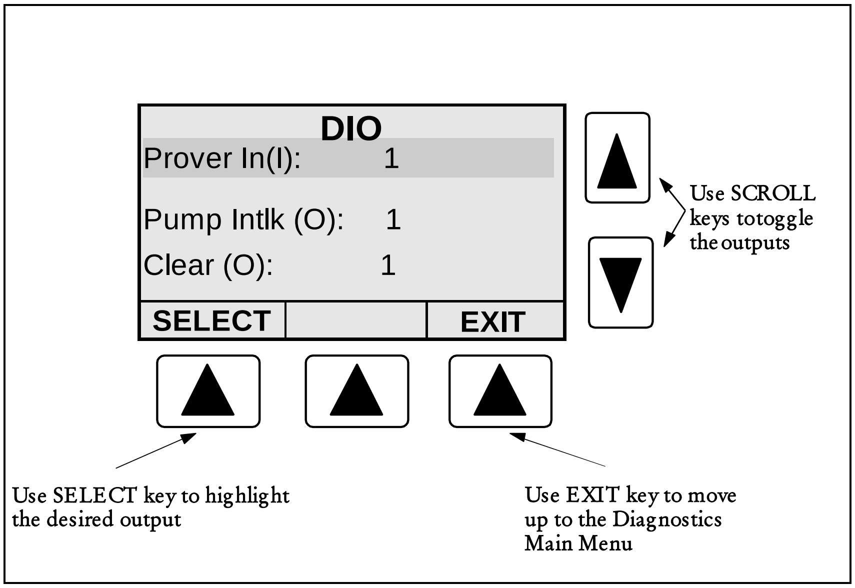


Figure 4. Digital I/O Diagnostics Screen

Pulse Output

The pulse output may be tested by connecting an oscilloscope or a voltmeter to the output connector on the ACE II rear panel. Press the SELECT key to highlight the output and the SCROLL Keys toggle the output between high and low states. A 1 outputs a high signal and a 0 outputs a low signal.

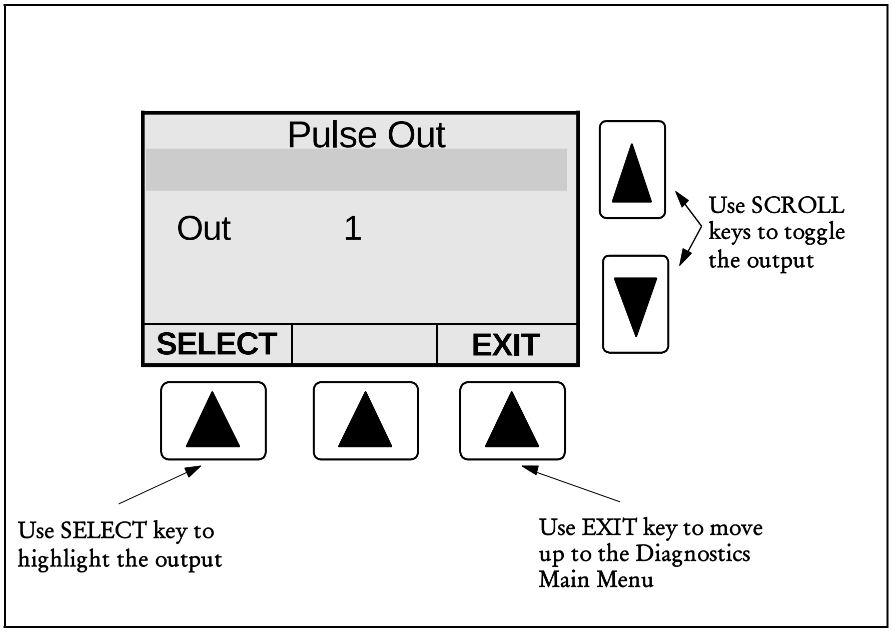


Figure 5. Pulse Output Diagnostics Screen.

Heater Sensor

This diagnostic feature displays the temperature (°C) measured by the digital temperature sensor on the ACE II front panel.

Base Conditions

Base temperature and pressure selected in the program menu can be viewed in this menu. ACE II uses base conditions to calculate corrected total volume and corrected flow rate.

Communications

ACE II is equipped with RS232 serial port and the optional infra-red port. The serial port has to be configured for either printing or Modbus functions in the ACE menu at Program/IO Configuration/RS232. It can be used for printing, programming the ACE II settings, communication with a personal computer, or with a Modbus master device. For programming ACE II from a personal computer using Hoffer configuration program, refer to the WinConfig section of this manual.

ACE II supports standard MODBUS RTU (binary) encoding. The following tables list Modbus addresses for the available Modbus commands.

Function Code 04 (Read Input Registers)

ABSOLUTE ADDRESS	DESCRIPTION
30001	Uncorrected Rate (X1, X10, X100 or X1000)
30002	High Word of Uncorrected Total
30003	Low Word of Uncorrected Total (X1, X10, X100 or X1000)
30004	High Word of Uncorrected Accum Total
30005	Low Word of Uncorrected Accum Total
30006	Corrected Rate (Mass or Volume) (X1, X10, X100 or X1000)
30007	High Word of Corrected Total
30008	Low Word of Corrected Total (X1, X10, X100 or X1000)
30009	High Word of Corrected Accum Total
30010	Low Word of Corrected Accum Total
30011	Pressure
30012	Density X 1000
30013	Temperature (Kelvin)
30014	OPEN
30015	OPEN
30016	OPEN

Function Code 01 (Coil Status)

ABSOLUTE ADDRESS	DESCRIPTION
00002-00008	OPEN
00009	Clear Totals
00010	Clear Accum Totals

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Installation

This section includes information specific to the ACE II flow computer installation. For installation information on the turbine flowmeter, temperature probe, pressure probe, or other equipment refer to the individual item's technical manuals.

Location of the ACE II

The ACE should be mounted at operator eye-level for the best viewing angle. Install the ACE on a horizontal surface near the access door of the trailer. Allow enough clearance for easy access to the signal cables.

CAUTION !

ACE II MUST BE INSTALLED IN THE HORIZONTAL POSITION. MOUNTING IN THIS POSITION IS CRITICAL TO ALLOW THE SHOCK MOUNTS TO FUNCTION PROPERLY AND PREVENT DAMAGE CAUSED BY TRUCK VIBRATION.

WARNING !

DO NOT OVER-TIGHTEN MOUNTING BOLTS. RECOMMENDED TIGHTENING TORQUE IS 105 LBS-IN. OVER-TIGHTENING MAY CAUSE SHOCK MOUNTS TO BREAK.

Cable Installation

- Install and secure cables to avoid contact with cold pipes.
- Attach cables to the appropriate connector on the back of the ACE.
- The power cable is a three-wire cable. Red lead connects to positive (+) battery lead. Black lead connects to negative (-) lead. White lead connects to chassis ground.
- The ACE has no power switch. Hoffer recommends providing the ACE II with a direct power lead from the battery. This will reduce interference from other operating systems. If a switch is required, HFC recommends using the main power switch on the trailer.
- Install dust caps on any unused connections.
- Tighten all cable assemblies.

ACE II Program Setup

After the installation of components is complete, the setup parameters must be reviewed prior to using the ACE II for customer delivery.

Printer Installation

The ACE II printer requires two cables for proper operation; one for connection to the ACE II RS232 port and the other for connection to the DC power supply.

For further information on the ACE II installation refer to the installation drawings located in the back of this manual.

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WinConfig Program

The Nova-Flow WinConfig Program allows for quick, easy configuration of the ACE II using a personal computer. All programmable fields available locally on the ACE II are also accessible through the WinConfig program. This chapter provides guidelines for basic operations available through WinConfig.

Installation

Minimum system requirements:

486 Processor running Windows 95/NT and a Communications Port.

Installation:

Insert the provided disk into the computer.
Click on the "Start" menu on the Windows desktop taskbar and select "Run".
Click on "Browse" and search for the drive in which the disk is located.
Select "Setup", and let the Setup Wizard guide the installation process.

Startup

Below is an illustration of the "Startup" screen that will appear when the WinConfig program is invoked. Make certain that ACE II is powered up before attempting to establish communications. Connection may be made to the ACE II via RS-232 communications cable or the infrared interface. Click on "Communications" then on "Initialize" and select the appropriate Com port designation and Com port type. After making the appropriate selections, click on "OK" and verify that the COMM Window in the bottom right corner of the screen displays "OK". After establishing Communications, the Startup screen will display the detected Unit Type and software version.

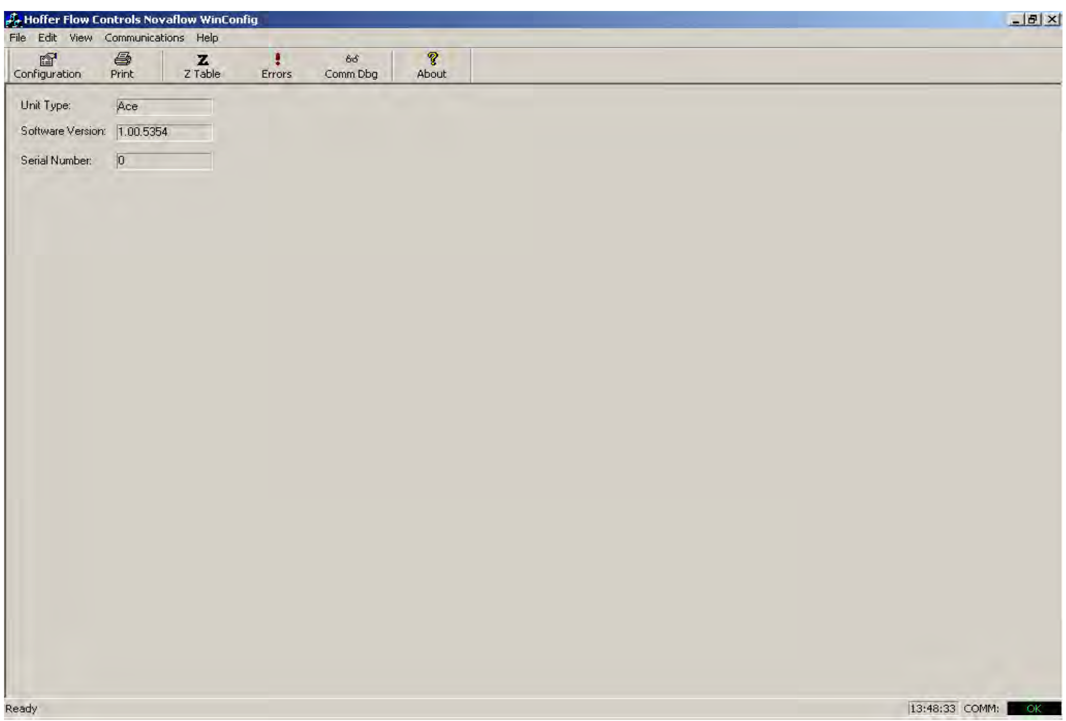


Figure 1. WinConfig Startup Screen

Print

Clicking on “Print” in the Startup screen will print a copy of the programmed configuration parameters to a printer connected to the personal computer. A preview of the printout may be displayed by selecting “File” and then “Print Preview”.

Configuration

After communications have been established, clicking on “Configuration” uploads program information from ACE II. Once the upload is complete, the I/O menu will be displayed. Other available menu items may be selected by clicking on the appropriate tabs at the top of the screen.

I/O Configuration Menu

The I/O Configuration Menu consists of two sub menus, Analog I/O and Digital I/O. The Configuration Menu is used to assign, configure, and calibrate inputs and outputs. Some diagnostic functions are also available in the I/O Menu.

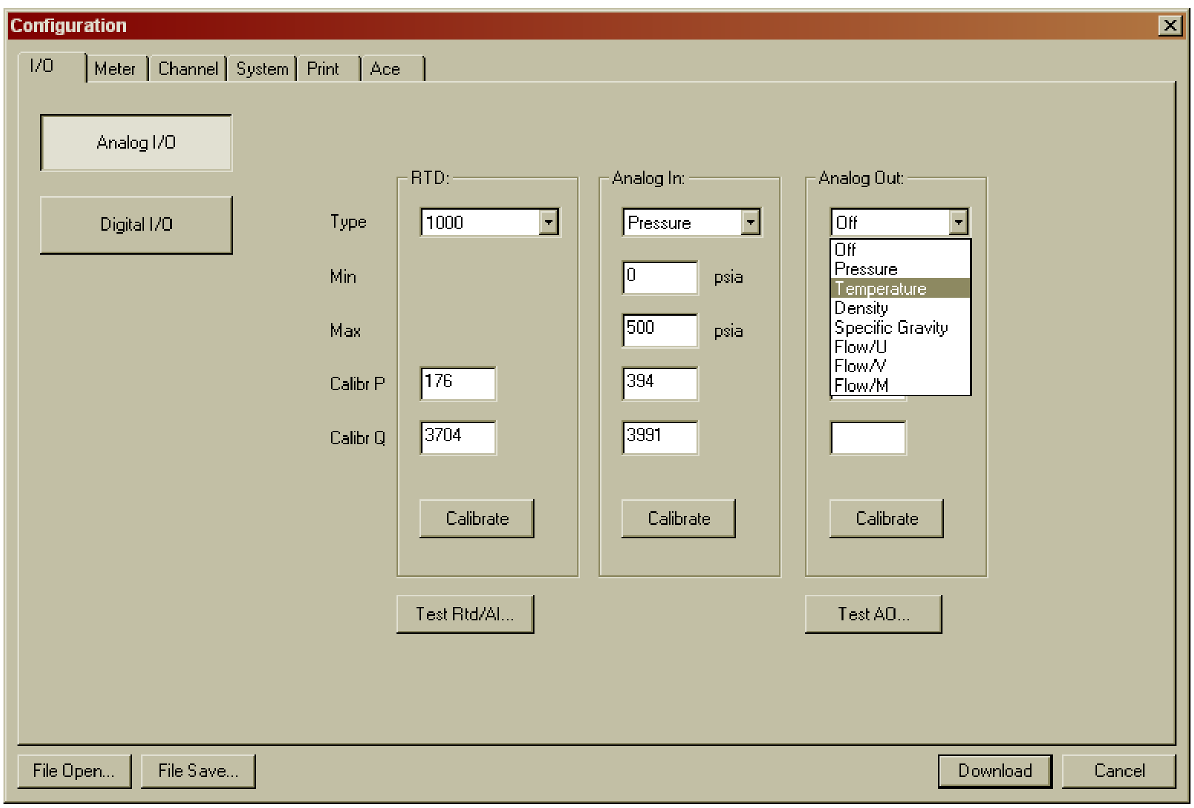


Figure 2. Analog I/O Configuration Menu.

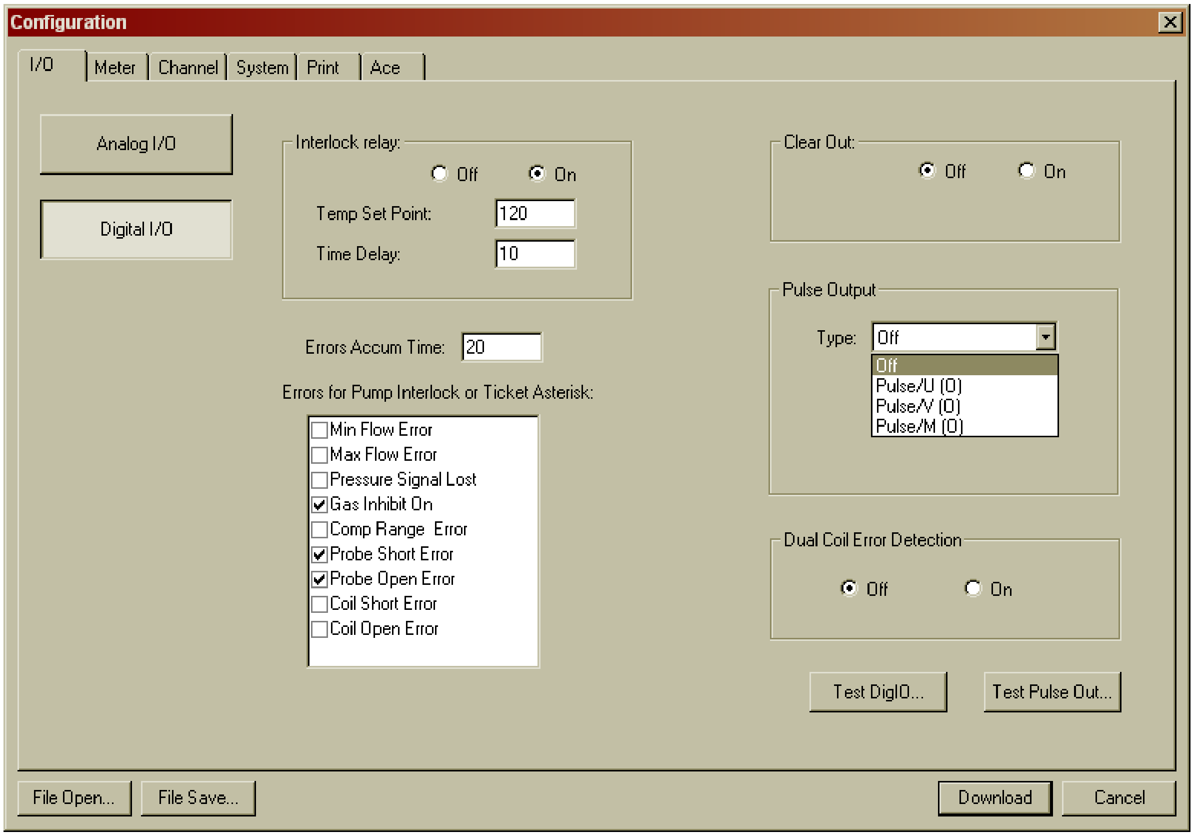


Figure 3. Digital I/O Configuration Menu.

Pump Interlock Option

A list of error conditions is provided, so that the user may select specific operational errors that will disable the pump relay and/or remove asterisks from the ticket printout. When the selected operating error occurs for a period exceeding the entry in the Errors Accumulated Time field, the pump relay will be disabled and flow stopped.

Meter Configuration Menu

The Meter Configuration Menu is used to configure all parameters associated with the connected flow meter(s). Included in this menu are fields for the meter serial number, meter size settings, and linearization parameters.

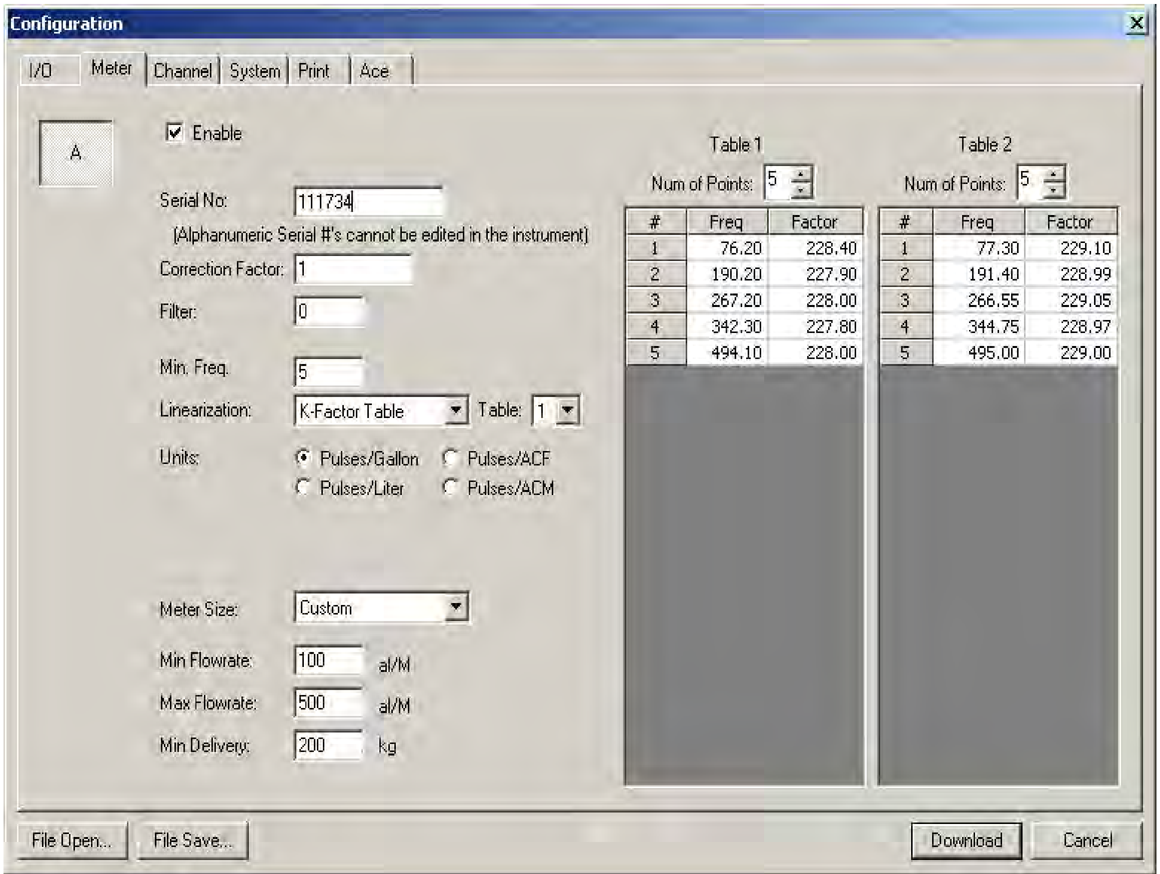


Figure 4. Meter Configuration Menu.

Channel Configuration Menu

The Channel Configuration Menu is used to configure metrological specifics such as compensation methods, fluid selection and unit selections. Modbus multipliers are

available for Total and Flowrate to increase the resolution of data retrieved via serial Modbus communications. See the Communications chapter for more information on Modbus protocol.

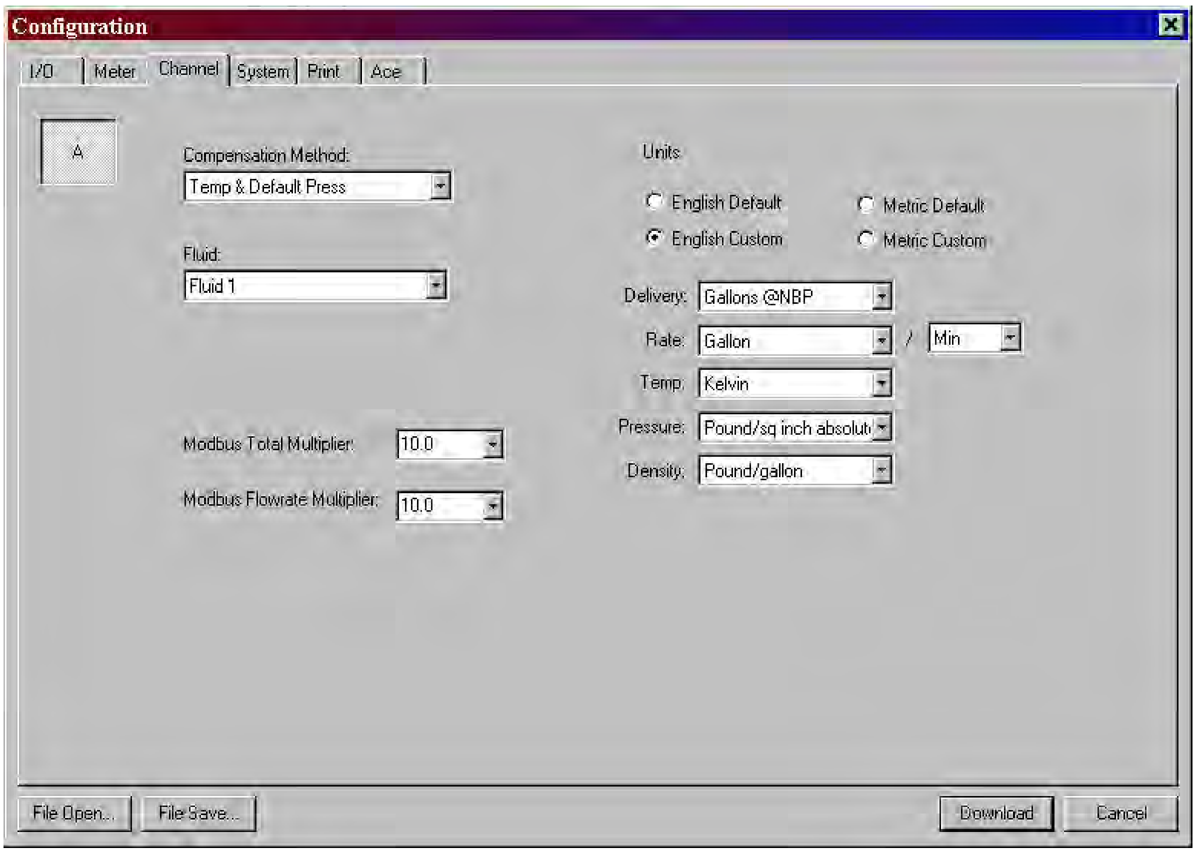


Figure 5. Channel Configuration Menu.

System Configuration Menu

The System Configuration Menu provides four lower level menus as follows:

Utility Functions: Program the Menu timeout feature and lock front panel buttons.

Password/Pin: Program two levels of password protection for up to ten users.

Fluid Properties: Provides configuration parameters for up to four different fluids.

Base Conditions: Select the appropriate operating conditions.

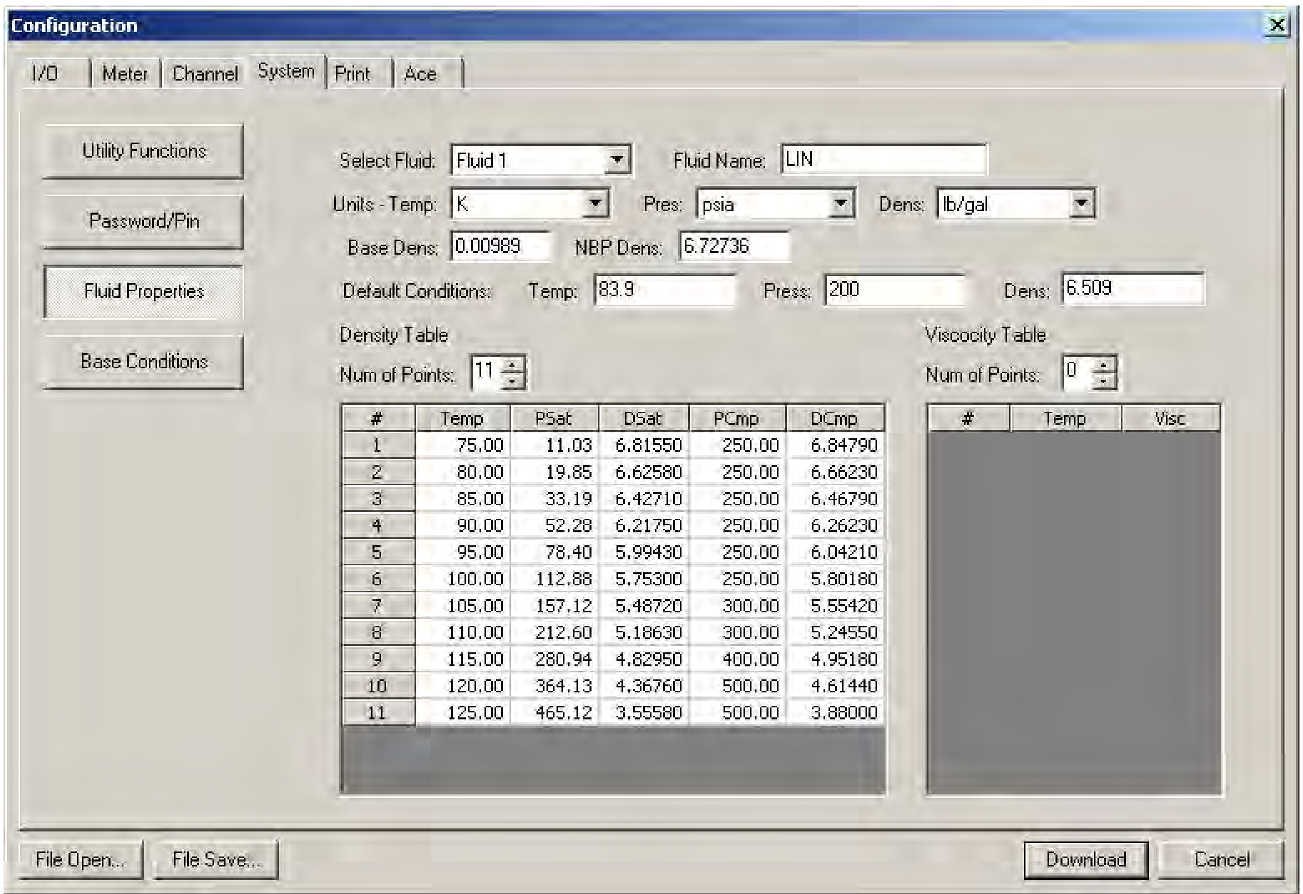


Figure 6. System Configuration Menu (Fluid Properties Shown).

Print Menu

The Print Menu is used to select the printer that is connected to the ACE II, define the associated column width, and select the ticket format for printing.

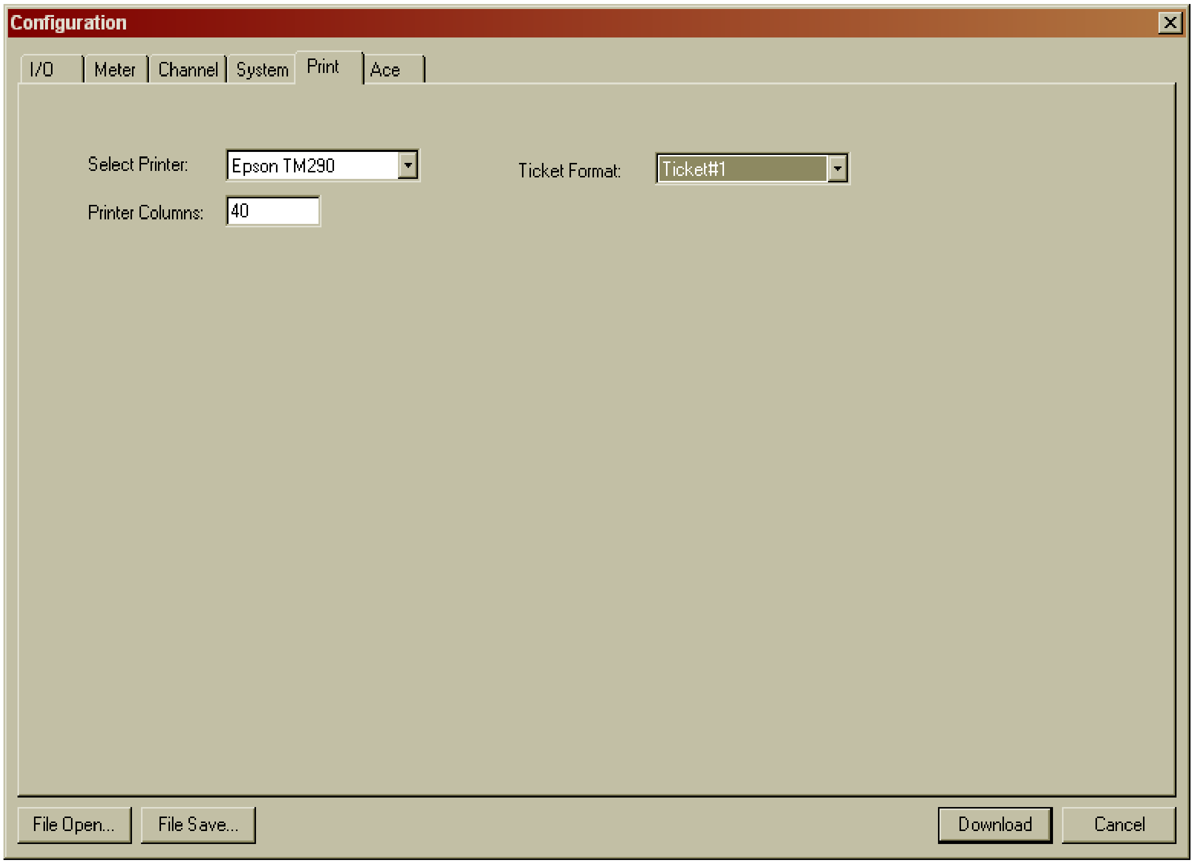


Figure 7. Print Menu.

ACE Menu

The ACE menu provides special configuration parameters for the ACE II. The trailer number may be entered, service dates recorded, and selections made for parameters to be displayed. There is also a tool to configure custom messages that will appear on the ACE II display as well as the ticket printout. Specifying codes are used for fluid name, temperature range and base conditions. This allows the display to automatically update when operating parameters change. These special messages are only configurable using the Windows Configuration Program.

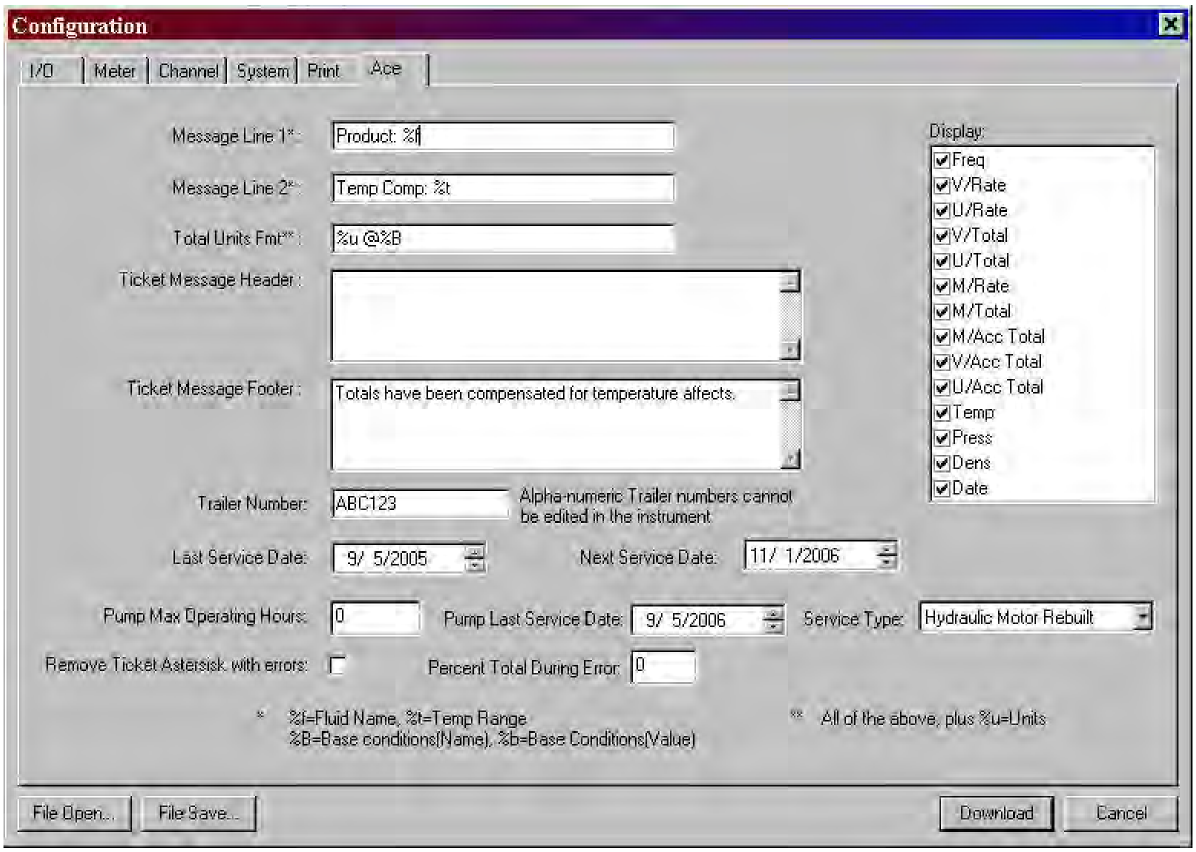


Figure 8. ACE Menu.

Downloading the Configuration

When all required parameters have been programmed, the configuration may be downloaded to the ACE II by clicking on the “Download” button located in the bottom right corner of the configuration screens. After the configuration has been downloaded, a software reset is required on the ACE II for the new configuration to take affect.

Configuration Files

WinConfig allows configurations to be saved as a file for future use. The two available file functions are File Open and File Save, which are described below.

Saving Configuration Files

After all required parameters have been programmed, click on the “File Save” button located in the bottom left corner of the configuration screens. When the “Save As” window appears, select the destination drive and directory, provide a name for the file and click on “Save”. All configuration files are given an .HFC extension.

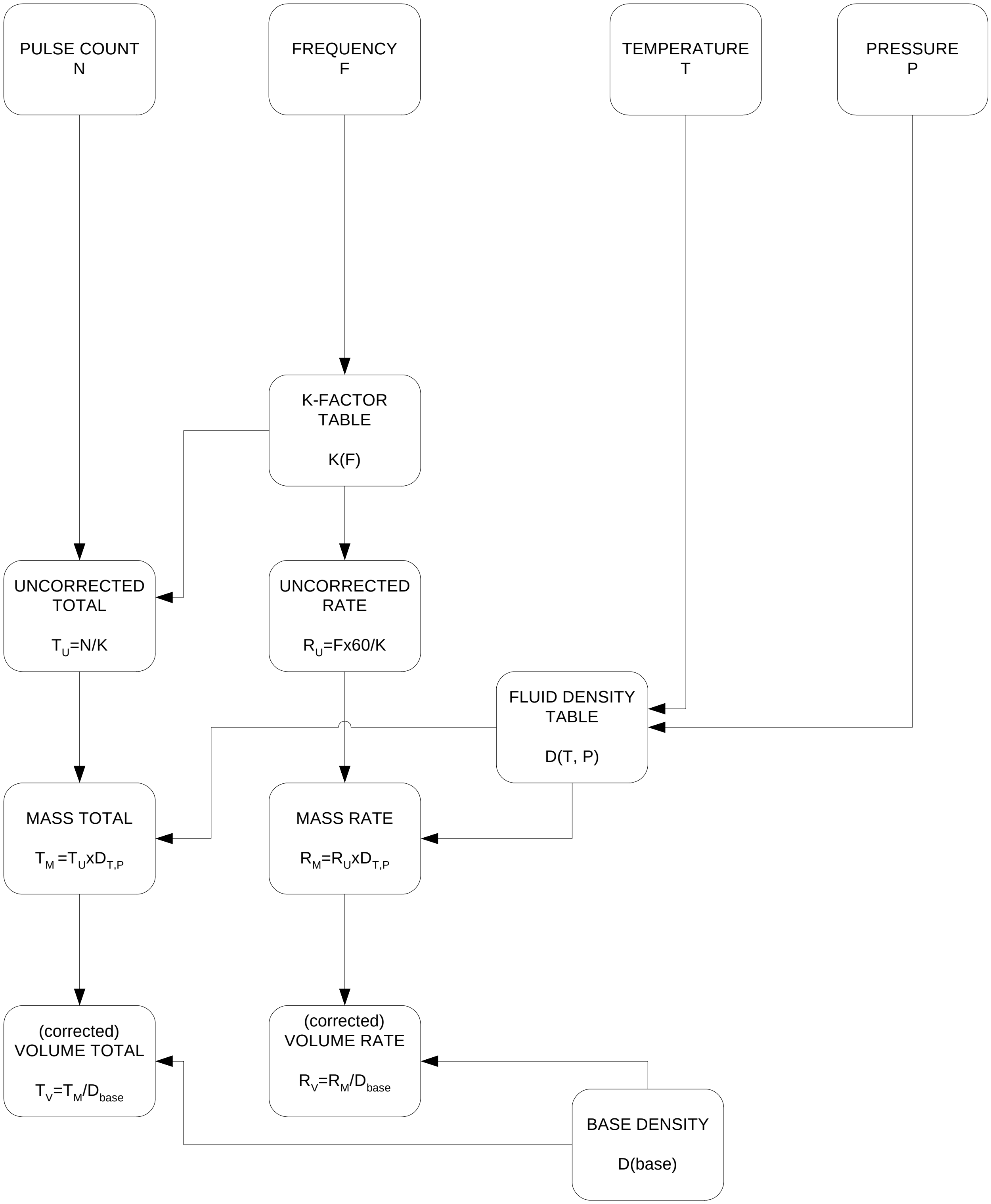
Opening Configuration Files

To recall previous configurations, click on the “File Open” button located in the bottom left corner of the configuration screens. When the “Open” window appears, select the proper drive and directory, select the desired .HFC file, and then click on “Open”.

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Appendix A: Liquid Calculation Flow Chart



Appendix B: Units of Measure

Liquid Volume

Full Name	Abbr. Name	Multiplier
Gallons	GAL	1
Liter	L	3.785411784
Milliliter	ML	3785.411784
Cubic feet	FT3	0.133680556
Pint	PT	8
Fluid once	FLOZ	128
Barrel (oil)	BBL	.02380952381
Cubic meter	M3	0.003785412
Cubic centimeter	CC	3785.411784
Quart	QT	4
Imperial gallon	IGAL	0.832674

Liquid Mass

Full Name	Abbr. Name	Multiplier
Pounds	LB	1
Kilograms	KG	0.45359237
Once	OZ	16
Ton	TON	0.0005
Metric ton	MTON	.00045
Gram	G	453.59237

Temperature

Full Name	Abbr. Name	Multiplier	Offset
Fahrenheit	F	1	0
Celsius	C	0.555555556	-32.00
Kelvin	K	0.555555556	+459.67
Rankine	R	1	+459.67

Pressure

Full Name	Abbr. Name	Multiplier	Offset
Pound/sq inch absolute	PSIA	1	0
Atmosphere	ATM	0.068045964	0
Pound/sq inch gauge	PSIG	1	-14.69595
Bar gauge	BAR-G	0.068947573	-0.944302
Bar absolute	BAR-A	0.068947573	0
Kilo Pascal gauge	KPA-G	6.894757293	-94.43024
Kilo Pascal absolute	KPA-A	6.894757293	0
Mega Pascal gauge	MPA-G	0.006894757	-0.09443
Mega Pascal absolute	MPA-A	0.006894757	0
kG/cm2-g	KG/CM2-G	0.070306958	-0.96292
kG/cm2-a	KG/CM2-A	0.070306958	0
Millimeter of water column	MM W.C.		
Inch of water column	IN W.C.	27.7075924	0
Millimeter of mercury	MM HG	51.71493257	0
Inch of mercury	IN HG	2.036020967	0

Density

Full Name	Abbr. Name	Multiplier
Pound/gallon	LB/GAL	1
Kilogram/liter	KG/L	0.119826427
Pound/cubic feet	LB/FT3	7.480519481
Kilogram/cubic meter	KG/M3	119.8264273

K-factor

Full Name	Abbr. Name	Multiplier
Pulse/gallon	PULSE/GALLON	1
Pulse/liter	PULSE/LITER	0.264172052
Pulse/ft3	PULSE/FT3	7.480519481
Pulse/m3	PULSE/M3	264.1720524

Time

Full Name	**Abbr. Name**	**Multiplier**
Second	SEC	1
Minute	MIN	
Hour	HR	
Day	DAY	

Appendix C: Error Messages

	MESSAGE	COMMENTS	Error reported on trip report.
1	TEMP SHORT	Temperature probe resistance input is less then 5 OHMS.	
2	TEMP OPEN	Temperature probe resistance input is more then 15K OHMS.	
3	PRESS FAIL	Pressure Analog signal input is not detected. The computed value of the analog input value is equal to zero volts.	
4	TEMP FAIL	Temperature signal analog input is not detected. The computed value of the analog input value is equal to zero volts.	
5	TEMP COMP	Temperature of the selected channel is out of range specified for analog input. It means the fluid temperature is out of accurate measurement range. This message will appear in normal operation during cool down and after the delivery is complete.	Yes
6	PRES COMP	Pressure is out of range specified for analog input. It means the fluid pressure is out of accurate measurement range. This message will appear in normal operation during cool down and after the delivery is complete.	Yes
7	PULSE FREQUENCY ERROR	Pulse error condition is detected in a dual coil system.	Yes
8	TWO PHASE WARNING	Pressure is between saturated pressure and 5 psia above the saturated pressure. It means that the liquid is approaching a point where it may contain bubbles, which will cause delivery error. It is normal to see this message while the meter is being cooled down.	
9	GAS INHIBIT	Pressure is equal or below the saturated pressure. It means there is no longer liquid in the meter run. It is normal to see this message before and during cool down and after the delivery has been completed. If it appears during a delivery, it is possible that the pump has lost prime.	Yes
10	FLOWMETER RUNNING	Displayed if the operator attempts to clear totals or make configuration changes while flow is present.	
11	CONFIG CHANGED RESET REQUIRED	Configuration parameters have been changed and saved. The unit must be reset for the changes to take effect.	
12	Min delivery error	This message is PRINTED on the delivery ticket only.	
13	Printer out of paper	No paper is detected in the printer.	
14	Printer off	Printer is off line.	
15	FLOW HH	Flow Rate has exceeded the limit defined in the High Flow limit field. This message may appear if the meter is being gas spun by cold gas. This can occur even if the delivery total is inhibited by the gas cutout feature.	Yes
16	FLOW LL	Flow Rate has exceeded the limit defined in the Low Flow limit field. It is normal to see this error message when cooling down and when switching over from recirculation to product delivery.	
17	COIL OPEN	Coil resistance is above the specified range	
18	COIL SHORT	Coil resistance is below the specified range	
19	BAD PULSE LIMIT EXCEEDED	“Bad Pulses” have exceeded the limit set for % of Total During Error.	

Appendix D: Reference Densities

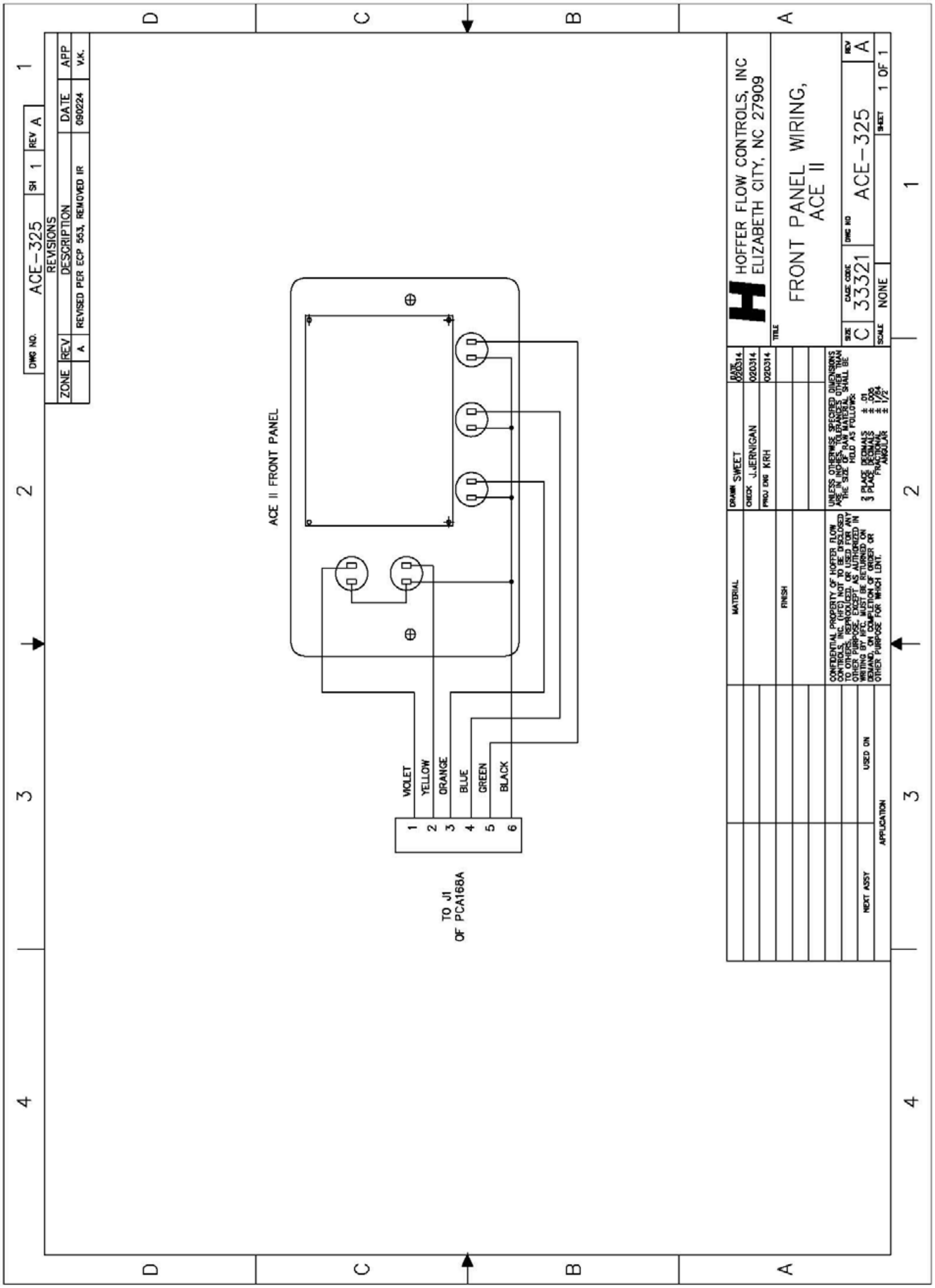
Reference Densities for LIN, LOX, LAR and CO2 (Per NIST 2004)

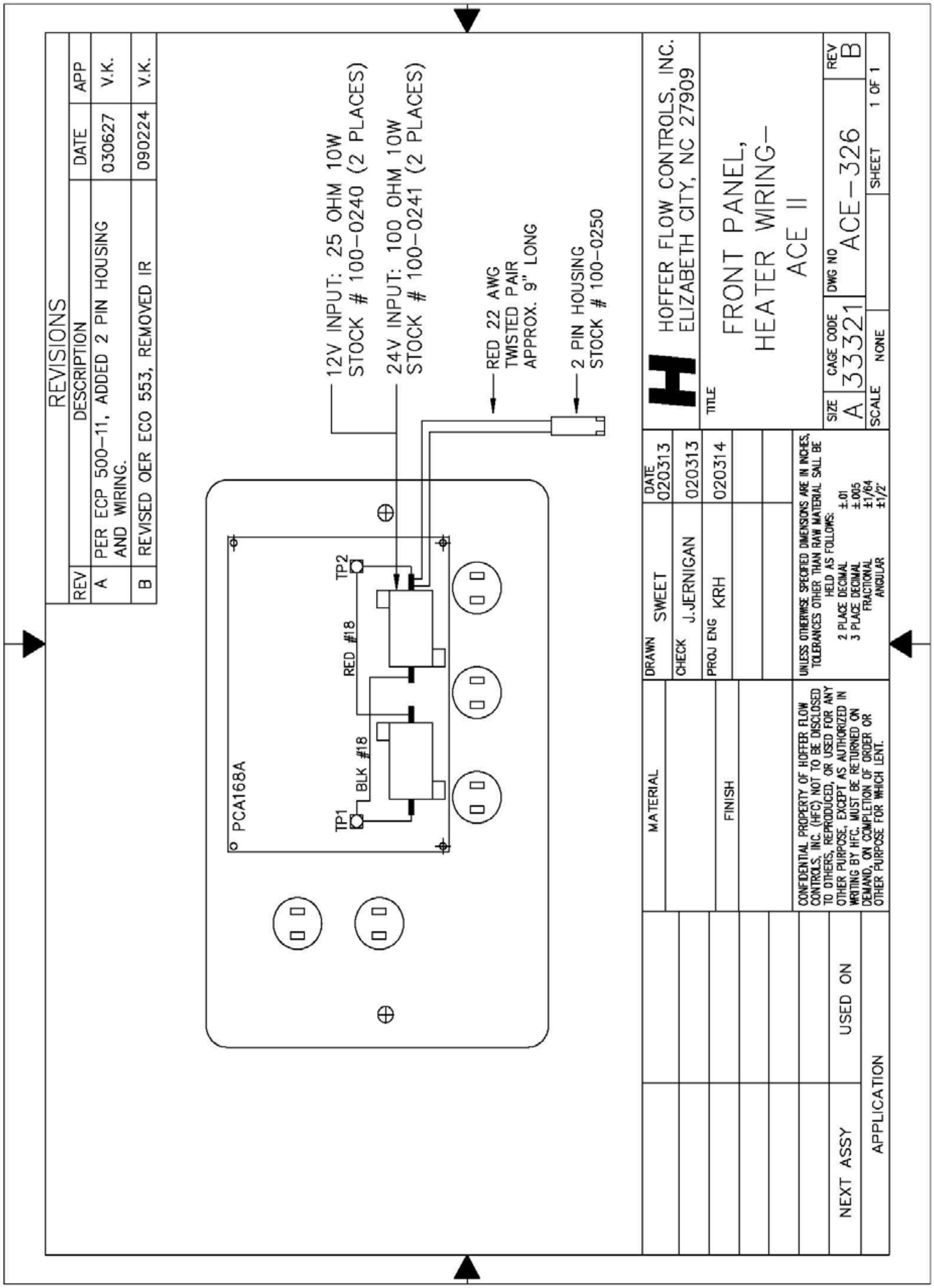
Reference Condition	Fluid	Temp *Deg C*	Press *PSIA*	Press *BAR-abs*	Density *LB/FT3*	Density *LB/GAL*	Density *KG/M3*
NIST *21˚ C, 101.325 Kpas*	LIN	21.00	14.696	1.013	0.072470	0.009688	1.160858
	LOX	21.00	14.696	1.013	0.082820	0.011071	1.326649
	LAR	21.00	14.696	1.013	0.103390	0.013821	1.656149
	CO2	21.00	14.696	1.013	0.114430	0.015297	1.832993
OIML *15˚ C, 101.325 Kpas*	LIN	15.00	14.696	1.013	0.073984	0.009890	1.185110
	LOX	15.00	14.696	1.013	0.084550	0.011303	1.354361
	LAR	15.00	14.696	1.013	0.105550	0.014110	1.690749
	CO2	15.00	14.696	1.013	0.116860	0.015622	1.871918
PTB *15˚ C, 1 BAR*	LIN	15.00	14.504	1.000	0.073016	0.009761	1.169604
	LOX	15.00	14.504	1.000	0.083444	0.011155	1.336645
	LAR	15.00	14.504	1.000	0.104170	0.013926	1.668643
	CO2	15.00	14.504	1.000	0.115320	0.015416	1.847249
SIRIM *30˚ C, 101.325 Kpas*	LIN	30.00	14.696	1.013	0.070313	0.009400	1.126306
	LOX	30.00	14.696	1.013	0.080353	0.010742	1.287132
	LAR	30.00	14.696	1.013	0.100310	0.013410	1.606812
	CO2	30.00	14.696	1.013	0.110980	0.014836	1.777729
ASIAN *27˚ C, 101.325 Kpas*	LIN	27.00	14.696	1.013	0.071018	0.009494	1.137599
	LOX	27.00	14.696	1.013	0.081159	0.010849	1.300042
	LAR	27.00	14.696	1.013	0.101320	0.013545	1.622991
	CO2	27.00	14.696	1.013	0.112100	0.014986	1.795670
NBP (1 ATM)	LIN	-195.80	14.696	1.013	50.324	6.727363	806.113
	LOX	-182.97	14.696	1.013	71.243	9.523835	1141.203
	LAR	-185.85	14.696	1.013	87.113	11.645353	1395.416
	CO2	-78.40	14.696	1.013	N/A	N/A	N/A
NORMAL *0˚ C, 101.325 Kpas*	LIN	0.00	14.696	1.013	0.078059	0.010435	1.250385
	LOX	0.00	14.696	1.013	0.089212	0.011926	1.429039
	LAR	0.00	14.696	1.013	0.111370	0.014888	1.783976
	CO2	0.00	14.696	1.013	0.123410	0.016498	1.976839

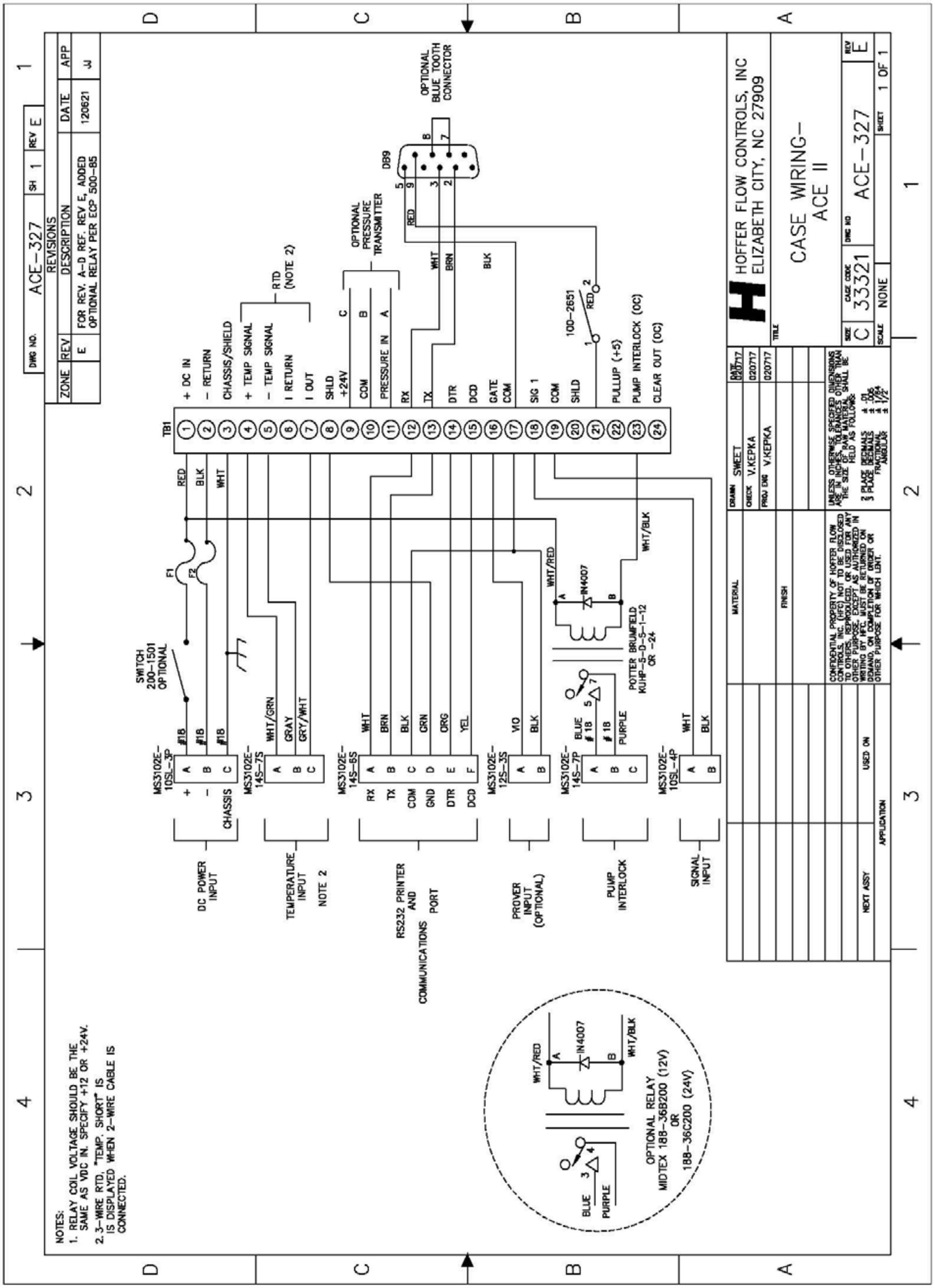
Appendix E: Changing The Display Language

ENGLISH	CZECH	POLISH	GERMAN	FRENCH	SPANISH (MX)	PORTUGUESE (BR)
To change the displayed language:	Abyste změnili zobrazovaný jazyk:	Aby zmienić wyświetlany język:	Gehen Sie folgendermaß en vor, um die angezeigte Sprache zu Andern:	Pour modifier la langue affichée	Par a cambiar el idioma mostrado:	Para alterar o idioma exibido:
MENU	MENU	MENU	MENU	MENU	MENU	MENU
SCROLL	KLAVESY PRO PRESUN	PRZEWIJANIA	ROLLTASTE	DEFILER	TECLAS CON FLECHA	ROLAGEM
ADVANCED SETTINGS	ROZSIRENA NASTAVENI	USTAWIENIA ZAAWANSOWANE	ERWEITERTE EINSTELLUNGEN	PARAMETRES AVANCES	CONFIGURACIO N AVANZADA	CONFIGURACOES AVANCADAS
SELECT	VYBRAT	WYBIERZ	AUSWAHL	SELECT	SEL	SELECIONAR
SCROLL	KLAVESY PRO PRESUN	PRZEWIJANIA	ROLLTASTE	DEFILER	TECLAS CON FLECHA	ROLAGEM
SYSTEM CONFIGURATION	KONFIGURACE SYSTEMU	KONFIG. SYST.	SYSTEMKONFIG	SYSTEME	CONFIG. DELSISTEMA	CONFIGURACAO DO SISTEMA
SELECT	VYBRAT	WYBIERZ	AUSWAHL	SELECT	SEL	SELECIONAR
UTILITY FUNCTIONS	POMOCNE FUNKCE	DZIALANIE PROGR. NARZ.	DIENSTPROGR. FUNKTIONEN	FONCTIONS UTILITAIRES	FUNCIONES DE UTILIDAD	FUNCOES UTILITARIAS
SELECT	VYBRAT	WYBIERZ	AUSWAHL	SELECT	SEL	SELECIONAR
SCROLL	KLAVESY PRO PRESUN	PRZEWIJANIA	ROLLTASTE	DEFILER	TECLAS CON FLECHA	ROLAGEM
LANGUAGE	JAZYK	JEZYK	SPRACHE	LANGE	IDIOMA	IDIOMA
EDIT	UPRAVIT	EDYTUJ	BEARB	MODIFIER	EDITAR	EDITAR
SCROLL	KLAVESY PRO PRESUN	PRZEWIJANIA	ROLLTASTE	DEFILER	TECLAS CON FLECHA	ROLAGEM
ACCEPT	PRIJMOUT	AKCEPTUJ	ANNEHMEN	ACCERTER	ACEPTAR	ACEITAR
HOME	DOMU	NA POCZ	HOME	ACCUEIL	INICIO	HOME
SAVE	ULOZIT	ZAPISZ	SPAREN	SAUVEGARDER	SALVAR	SALVAR
RESET	RESET	KASOWANIE	REINICIALIZAR	REAJUSTE	REINICIAR	REINICIALIZAR

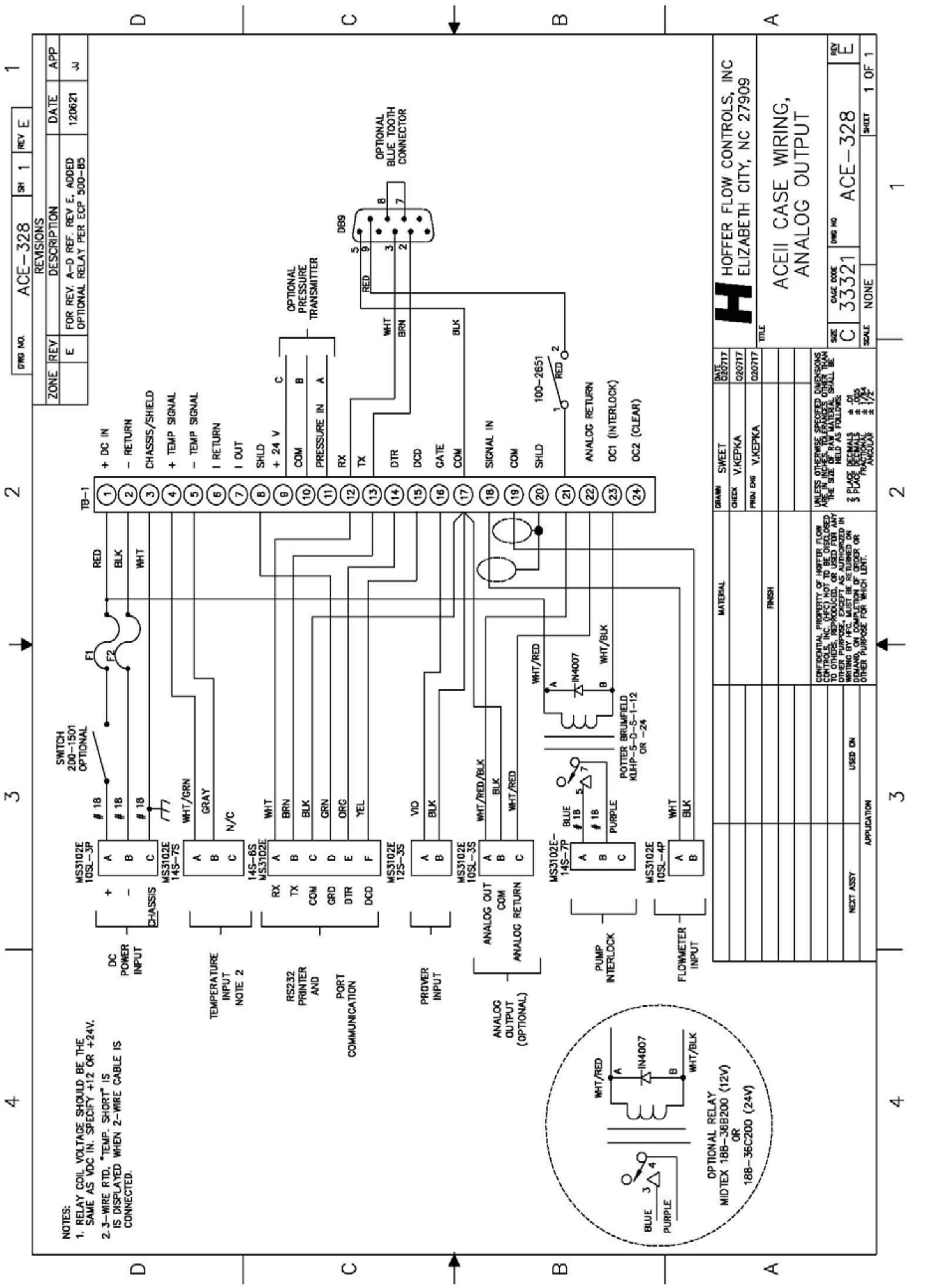
Appendix F: Drawings


HOFFER FLOW CONTROLS, INC
ELIZABETH CITY, NC 27909
FRONT PANEL WIRING,
ACE II
ACE-325
33321
NONE
1 OF 1
DWG NO. ACE-325 SH 1 REV A
REVISIONS
ZONE
REV
DESCRIPTION
DATE
APP
A
REVISED PER ECP 553, REMOVED IR
090224
V.K.
ACE II FRONT PANEL
VIOLET
YELLOW
ORANGE
BLUE
GREEN
BLACK
TO J1
OF PCA168A
DRAWN SWEET
CHECK J.JERNIGAN
PROJ ENG KRH
MATERIAL
FINISH
NEXT ASSY
USED ON
APPLICATION

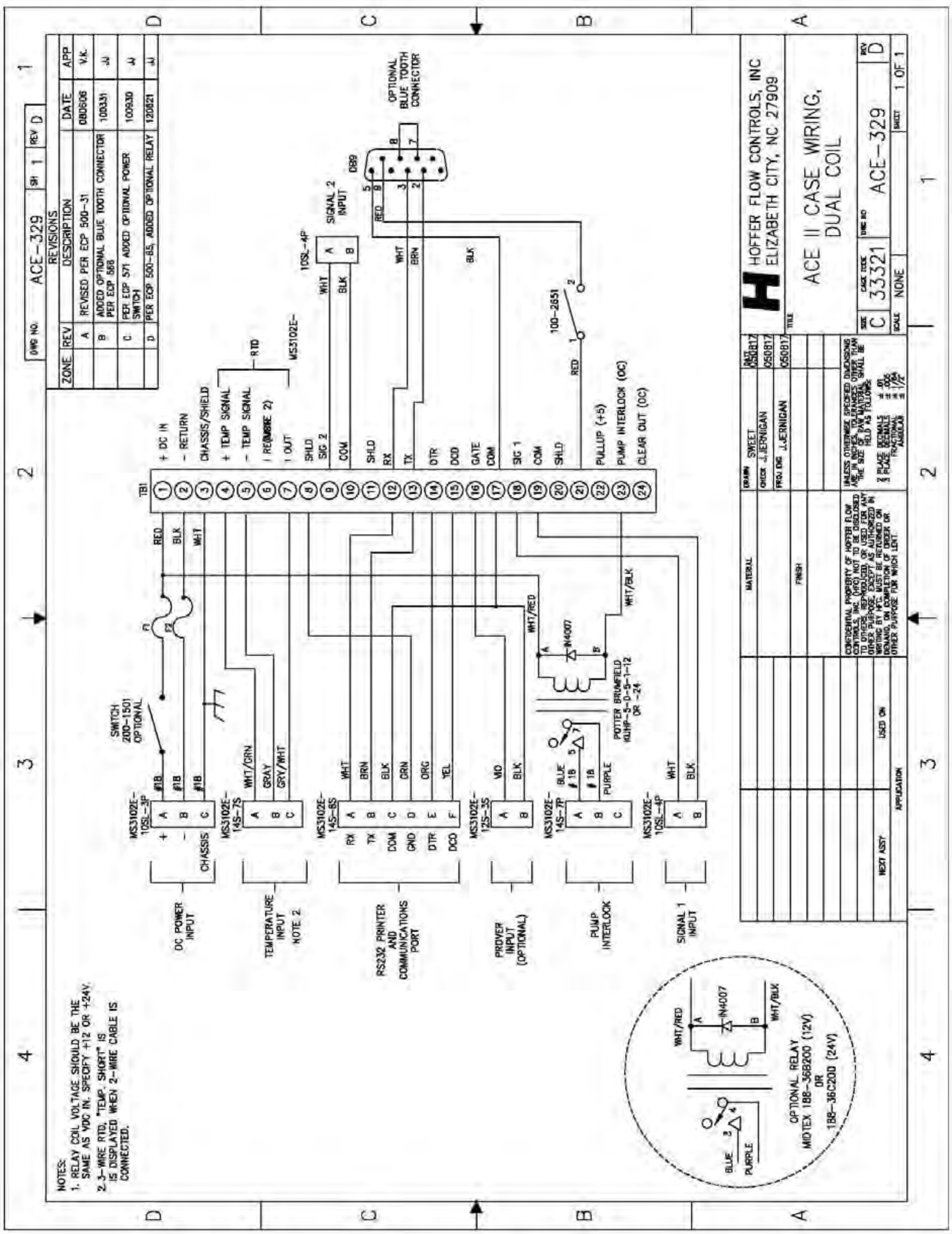

REVISIONS
REV
DESCRIPTION
DATE
APP
A
PER ECP 500-11, ADDED 2 PIN HOUSING AND WIRING.
030627
V.K.
B
REVISED OER ECO 553, REMOVED IR
090224
V.K.
12V INPUT: 25 OHM 10W
STOCK # 100-0240 (2 PLACES)
24V INPUT: 100 OHM 10W
STOCK # 100-0241 (2 PLACES)
RED 22 AWG
TWISTED PAIR
APPROX. 9" LONG
2 PIN HOUSING
STOCK # 100-0250
TP2
RED #18
BLK #18
TP1
PCA168A
HOFFER FLOW CONTROLS, INC.
ELIZABETH CITY, NC 27909
TITLE
FRONT PANEL,
HEATER WIRING-
ACE II
DRAWN SWEET
DATE 020313
CHECK J.JERNIGAN 020313
PROJ ENG KRH 020314
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES, TOLERANCES OTHER THAN RAW MATERIAL SALL BE HELD AS FOLLOWS:
2 PLACE DECIMAL ±.01
3 PLACE DECIMAL ±.005
FRACTIONAL ±1/64
ANGULAR ±1/2°
SIZE A
CAGE CODE 33321
DWG NO ACE-326
REV B
SCALE NONE
SHEET 1 OF 1
MATERIAL
FINISH
CONFIDENTIAL PROPERTY OF HOFFER FLOW CONTROLS, INC. (HFC) NOT TO BE DISCLOSED TO OTHERS, REPRODUCED, OR USED FOR ANY OTHER PURPOSE, EXCEPT AS AUTHORIZED IN WRITING BY HFC. MUST BE RETURNED ON DEMAND, ON COMPLETION OF ORDER OR OTHER PURPOSE FOR WHICH LENT.
NEXT ASSY
USED ON
APPLICATION

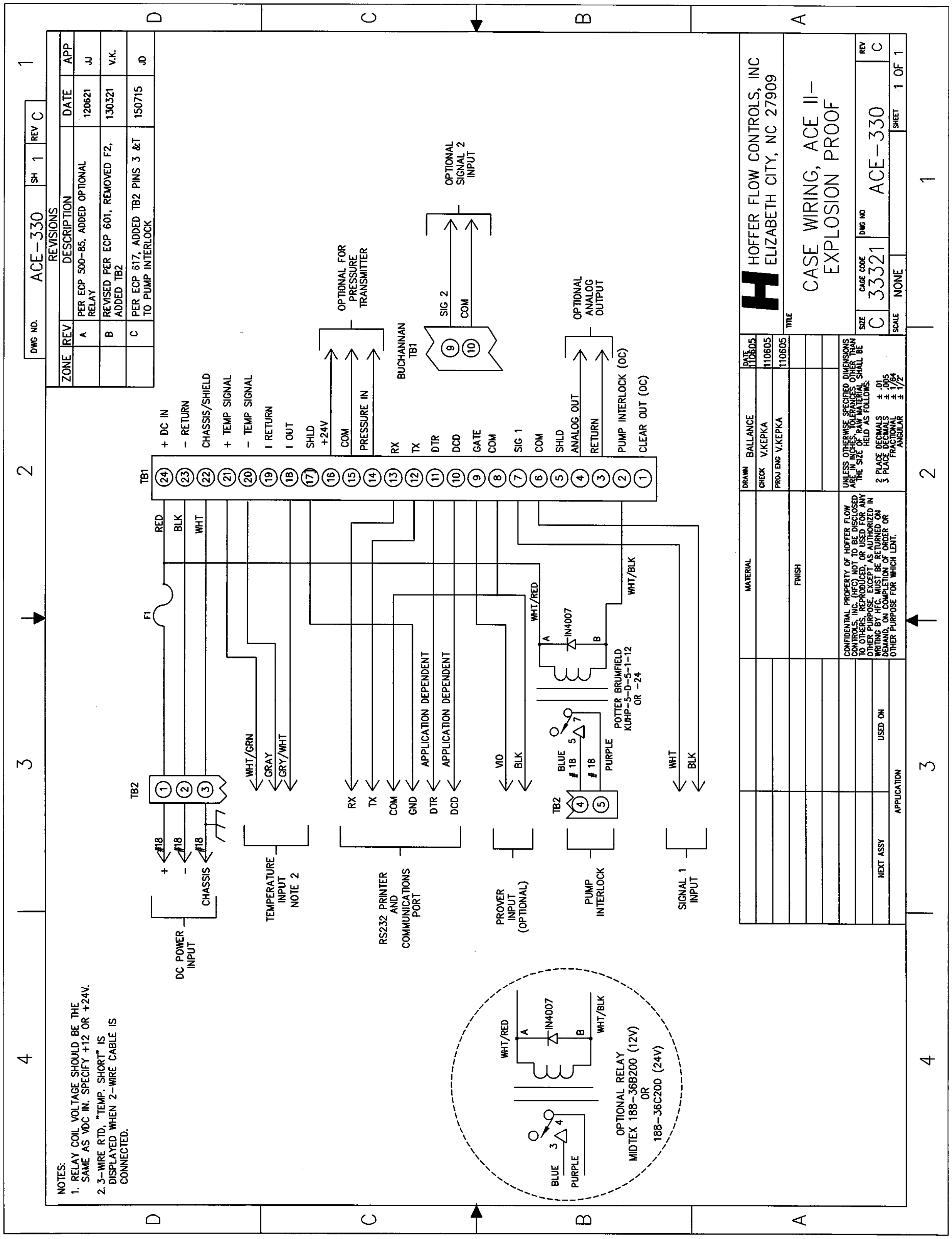


HOFFER FLOW CONTROLS, INC
ELIZABETH CITY, NC 27909
CASE WIRING–
ACE II
ACE–327
33321
NONE
1 OF 1
REVISIONS
FOR REV. A–D REF. REV E, ADDED OPTIONAL RELAY PER ECP 500–85
120621
NOTES:
1. RELAY COIL VOLTAGE SHOULD BE THE SAME AS VDC IN. SPECIFY +12 OR +24V.
2. 3–WIRE RTD. "TEMP. SHORT" IS DISPLAYED WHEN 2–WIRE CABLE IS CONNECTED.
DC POWER INPUT
TEMPERATURE INPUT
NOTE 2
RS232 PRINTER AND COMMUNICATIONS PORT
PROVER INPUT (OPTIONAL)
PUMP INTERLOCK
SIGNAL INPUT
SWITCH 200–1501 OPTIONAL
POTTER BRUMFIELD KUHP–5–D–5–1–12 OR –24
OPTIONAL RELAY MIDTEX 188–36B200 (12V) OR 188–36C200 (24V)
OPTIONAL PRESSURE TRANSMITTER
OPTIONAL BLUE TOOTH CONNECTOR
DB9
RTD (NOTE 2)
TB1
+ DC IN
– RETURN
CHASSIS/SHIELD
+ TEMP SIGNAL
– TEMP SIGNAL
I RETURN
I OUT
SHLD
+24V
COM
PRESSURE IN
RX
TX
DTR
DCD
GATE
COM
SIG 1
COM
SHLD
PULLUP (+5)
PUMP INTERLOCK (OC)
CLEAR OUT (OC)



HOFFER FLOW CONTROLS, INC
ELIZABETH CITY, NC 27909
ACEII CASE WIRING,
ANALOG OUTPUT
ACE-328
REV E
1 OF 1
REVISIONS
FOR REV. A-D REF. REV E, ADDED OPTIONAL RELAY PER ECP 500-85
120621
NOTES:
1. RELAY COIL VOLTAGE SHOULD BE THE SAME AS VDC IN. SPECIFY +12 OR +24V.
2. 3-WIRE RTD. "TEMP. SHORT" IS IS DISPLAYED WHEN 2-WIRE CABLE IS CONNECTED.
DC POWER INPUT
TEMPERATURE INPUT NOTE 2
RS232 PRINTER AND PORT COMMUNICATION
PROVER INPUT
ANALOG OUTPUT (OPTIONAL)
PUMP INTERLOCK
FLOWMETER INPUT
OPTIONAL PRESSURE TRANSMITTER
OPTIONAL BLUE TOOTH CONNECTOR
DB9
SWITCH 200-1501 OPTIONAL
POTTER BRUMFIELD KUHP-5-D-5-1-12 OR -24
OPTIONAL RELAY MIDTEX 188-36B200 (12V) OR 188-36C200 (24V)
+ DC IN
- RETURN
CHASSIS/SHIELD
+ TEMP SIGNAL
- TEMP SIGNAL
I RETURN
I OUT
SHLD
+ 24 V
COM
PRESSURE IN
RX
TX
DTR
DCD
GATE
COM
SIGNAL IN
COM
SHLD
ANALOG RETURN
OC1 (INTERLOCK)
OC2 (CLEAR)

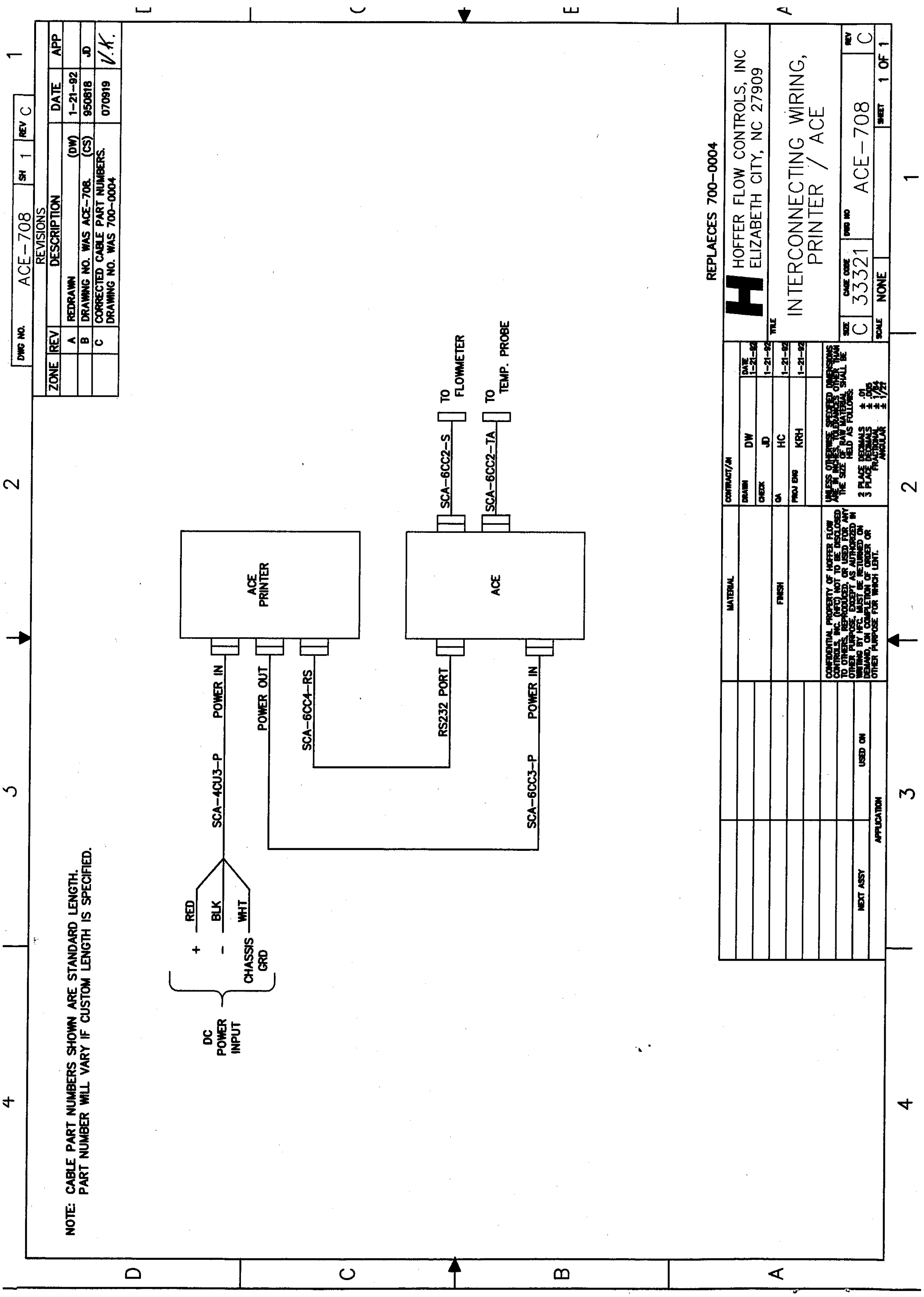

HOFFER FLOW CONTROLS, INC
ELIZABETH CITY, NC 27909
ACE II CASE WIRING, DUAL COIL
ACE-329
REVISIONS
A REVISED PER ECP 500-31 080606 V.K.
B ADDED OPTIONAL BLUE TOOTH CONNECTOR PER ECP 568 100331 JJ
C PER ECP 571 ADDED OPTIONAL POWER SWITCH 100930 JJ
D PER ECP 500-85, ADDED OPTIONAL RELAY 120821 JJ
NOTES:
1. RELAY COIL VOLTAGE SHOULD BE THE SAME AS VDC IN. SPECIFY +12 OR +24V.
2. 3-WIRE RTD, "TEMP. SHORT" IS IS DISPLAYED WHEN 2-WIRE CABLE IS CONNECTED.
DC POWER INPUT
TEMPERATURE INPUT NOTE 2
RS232 PRINTER AND COMMUNICATIONS PORT
PROVER INPUT (OPTIONAL)
PUMP INTERLOCK
SIGNAL 1 INPUT
SIGNAL 2 INPUT
OPTIONAL BLUE TOOTH CONNECTOR
OPTIONAL RELAY MIDTEX 188-36B200 (12V) OR 188-36C200 (24V)
POTTER BRUMFIELD KUHP-5-D-5-1-12 OR -24
SWITCH 200-1501 OPTIONAL
+ DC IN
- RETURN
CHASSIS/SHIELD
+ TEMP SIGNAL
- TEMP SIGNAL
PULLUP (+5)
PUMP INTERLOCK (OC)
CLEAR OUT (OC)

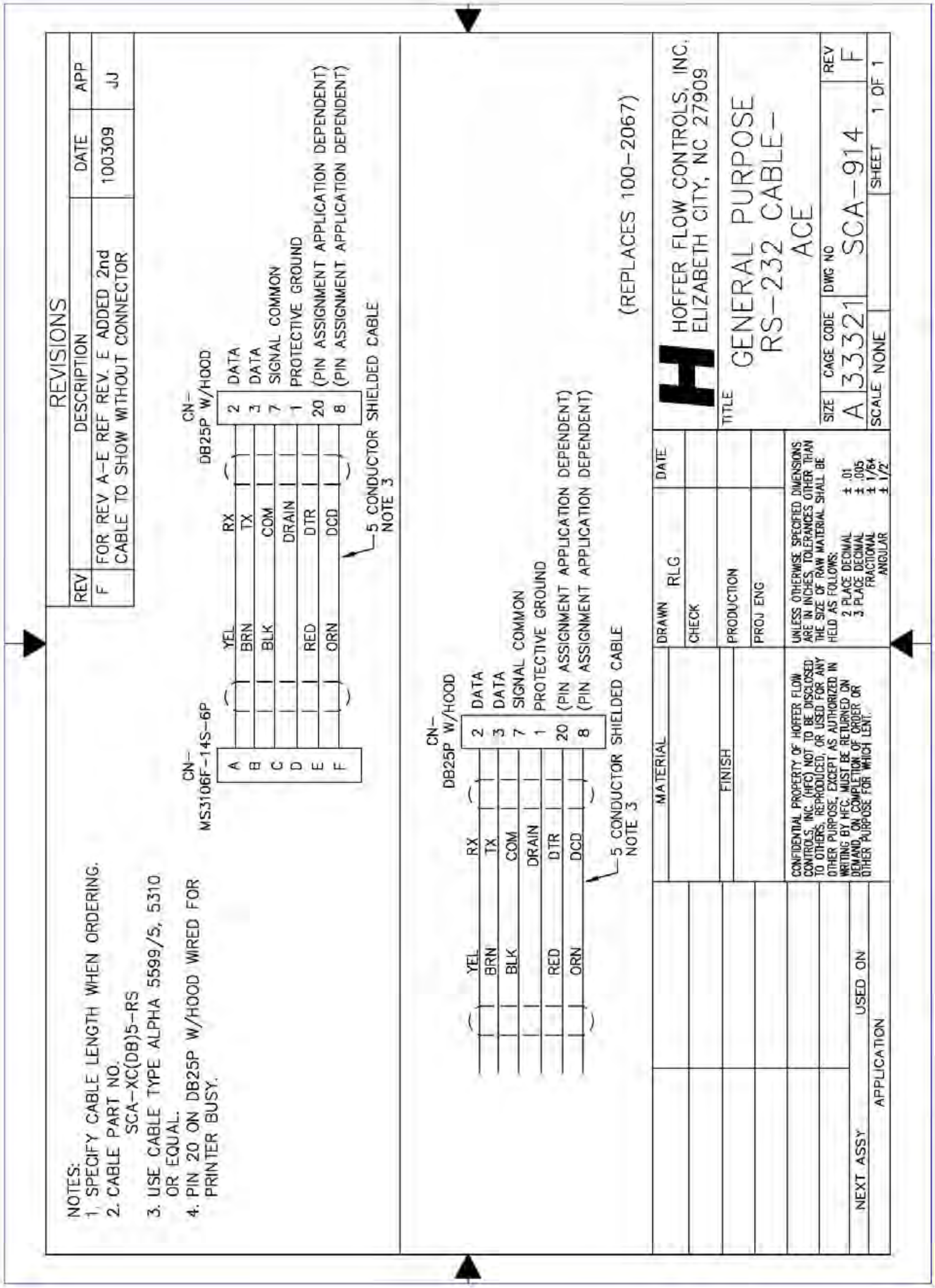

DWG NO. ACE-330 SH 1 REV C
REVISIONS
ZONE | REV | DESCRIPTION | DATE | APP
A | PER ECP 500-85, ADDED OPTIONAL RELAY | 120621 | JJ
B | REVISED PER ECP 601, REMOVED F2, ADDED TB2 | 130321 | V.K.
C | PER ECP 617, ADDED TB2 PINS 3 &T TO PUMP INTERLOCK | 150715 | JD
TB1
+ DC IN
- RETURN
CHASSIS/SHIELD
+ TEMP SIGNAL
- TEMP SIGNAL
I RETURN
I OUT
SHLD
+24V
COM
PRESSURE IN
RX
TX
DTR
DCD
GATE
COM
SIG 1
COM
SHLD
ANALOG OUT
RETURN
PUMP INTERLOCK (OC)
CLEAR OUT (OC)
OPTIONAL FOR PRESSURE TRANSMITTER
BUCHANNAN TB1
SIG 2
COM
OPTIONAL SIGNAL 2 INPUT
OPTIONAL ANALOG OUTPUT
RED
BLK
WHT
F1
WHT/RED
IN4007
WHT/BLK
POTTER BRUMFIELD KUHP-5-D-5-1-12 OR -24
TB2
WHT/GRN
GRAY
GRY/WHT
APPLICATION DEPENDENT
APPLICATION DEPENDENT
VIO
BLK
BLUE #18
#18
PURPLE
WHT
BLK
RX
TX
COM
GND
DTR
DCD
#18
CHASSIS
DC POWER INPUT
TEMPERATURE INPUT NOTE 2
RS232 PRINTER AND COMMUNICATIONS PORT
PROVER INPUT (OPTIONAL)
PUMP INTERLOCK
SIGNAL 1 INPUT
OPTIONAL RELAY MIDTEX 188-36B200 (12V) OR 188-36C200 (24V)
NOTES:
1. RELAY COIL VOLTAGE SHOULD BE THE SAME AS VDC IN. SPECIFY +12 OR +24V.
2. 3-WIRE RTD, "TEMP. SHORT" IS DISPLAYED WHEN 2-WIRE CABLE IS CONNECTED.
HOFFER FLOW CONTROLS, INC
ELIZABETH CITY, NC 27909
CASE WIRING, ACE II-EXPLOSION PROOF
SIZE C
CAGE CODE 33321
DWG NO ACE-330
REV C
SCALE NONE
SHEET 1 OF 1
DRAWN BALLANCE 110605
CHECK V.KEPKA 110605
PROJ ENG V.KEPKA 110605
MATERIAL
FINISH
NEXT ASSY
USED ON
APPLICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES OTHER THAN THE SIZE OF RAW MATERIAL SHALL BE HELD AS FOLLOWS:
2 PLACE DECIMALS ± .01
3 PLACE DECIMALS ± .005
FRACTIONAL ± 1/64
ANGULAR ± 1/2°
CONFIDENTIAL PROPERTY OF HOFFER FLOW CONTROLS, INC. (HFC) NOT TO BE DISCLOSED TO OTHERS, REPRODUCED, OR USED FOR ANY OTHER PURPOSE, EXCEPT AS AUTHORIZED IN WRITING BY HFC. MUST BE RETURNED ON DEMAND, ON COMPLETION OF ORDER OR OTHER PURPOSE FOR WHICH LENT.

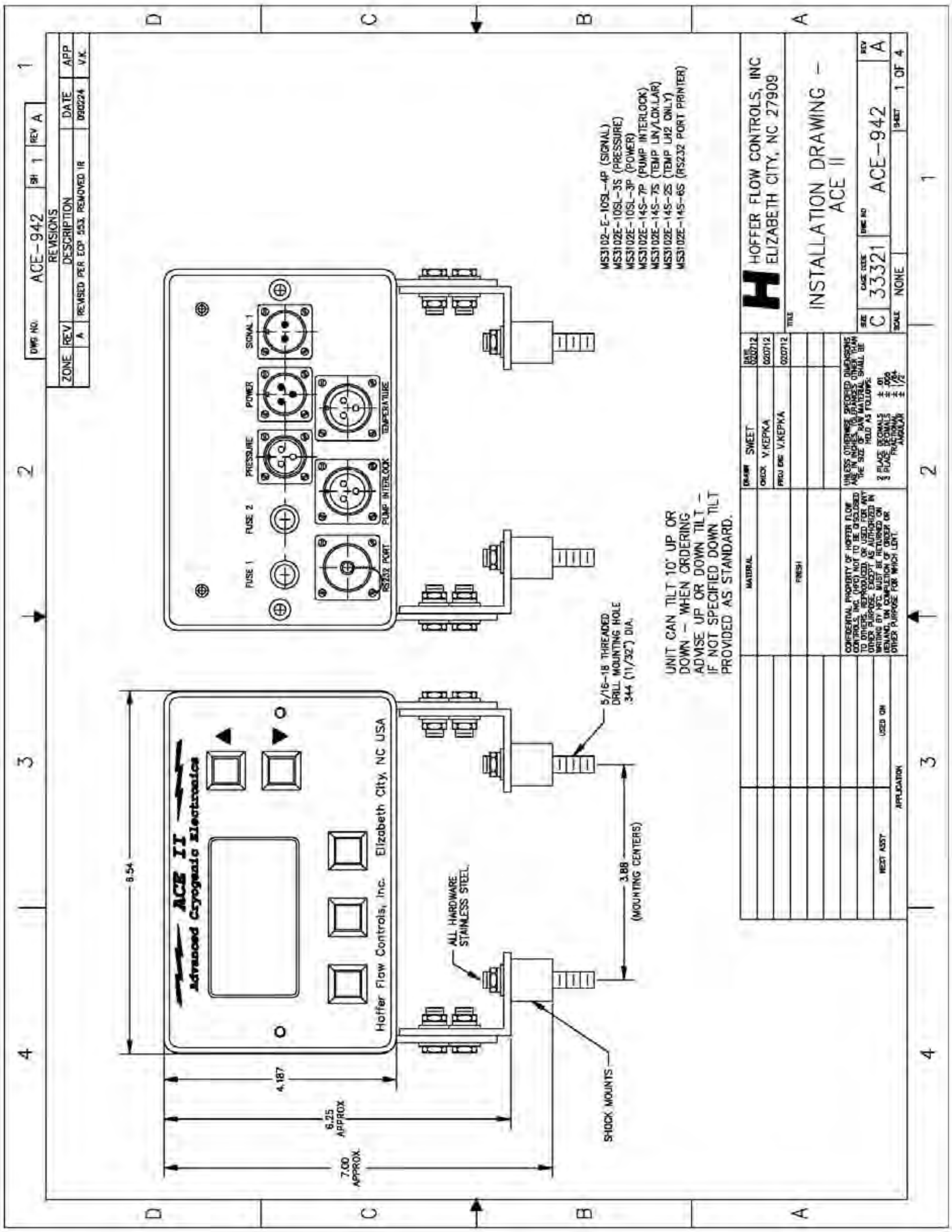
Wiring External Cables to Explosion Proof ACE II

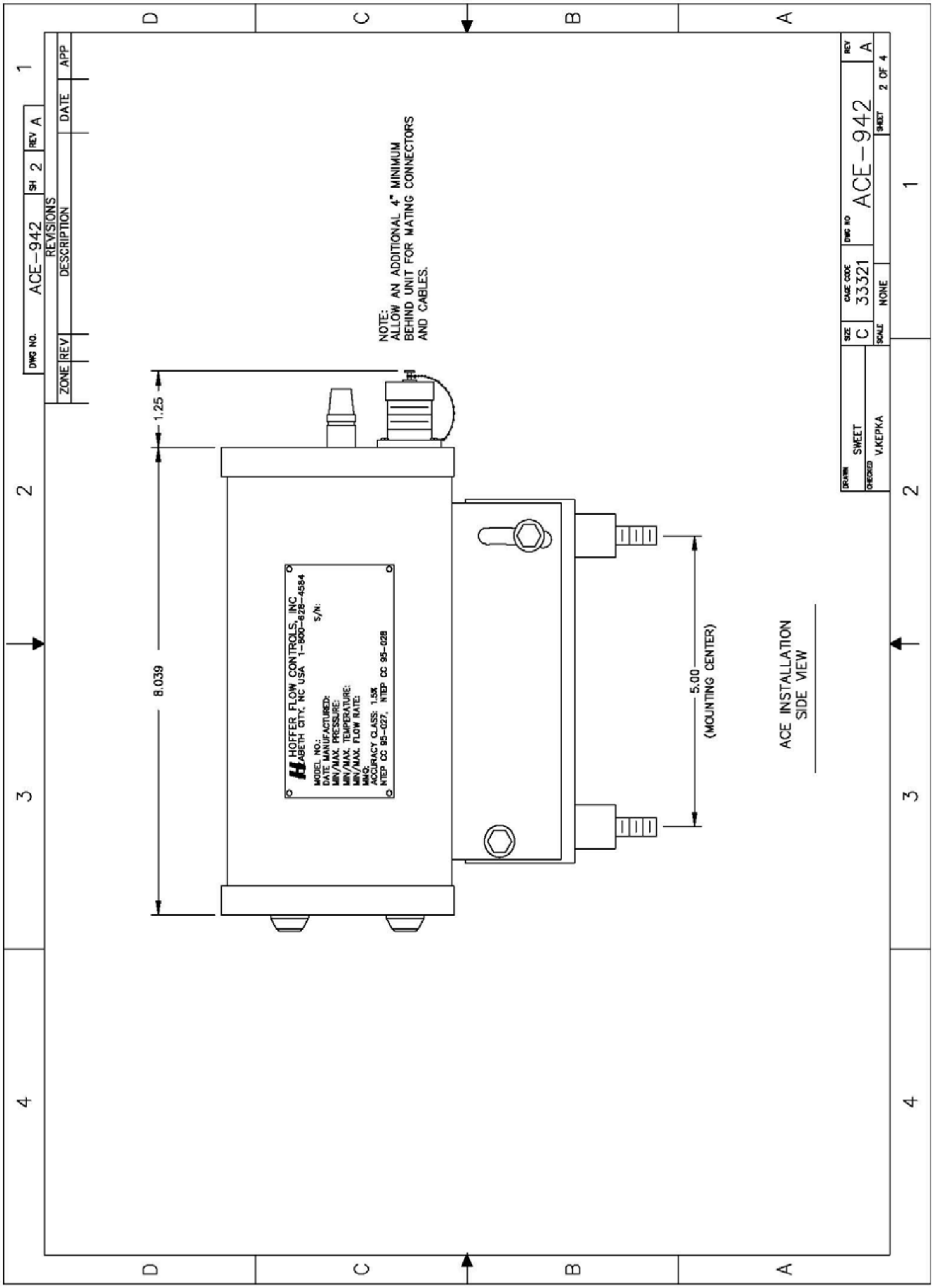
Hoffer Flow Controls, Inc. 1/13/2015

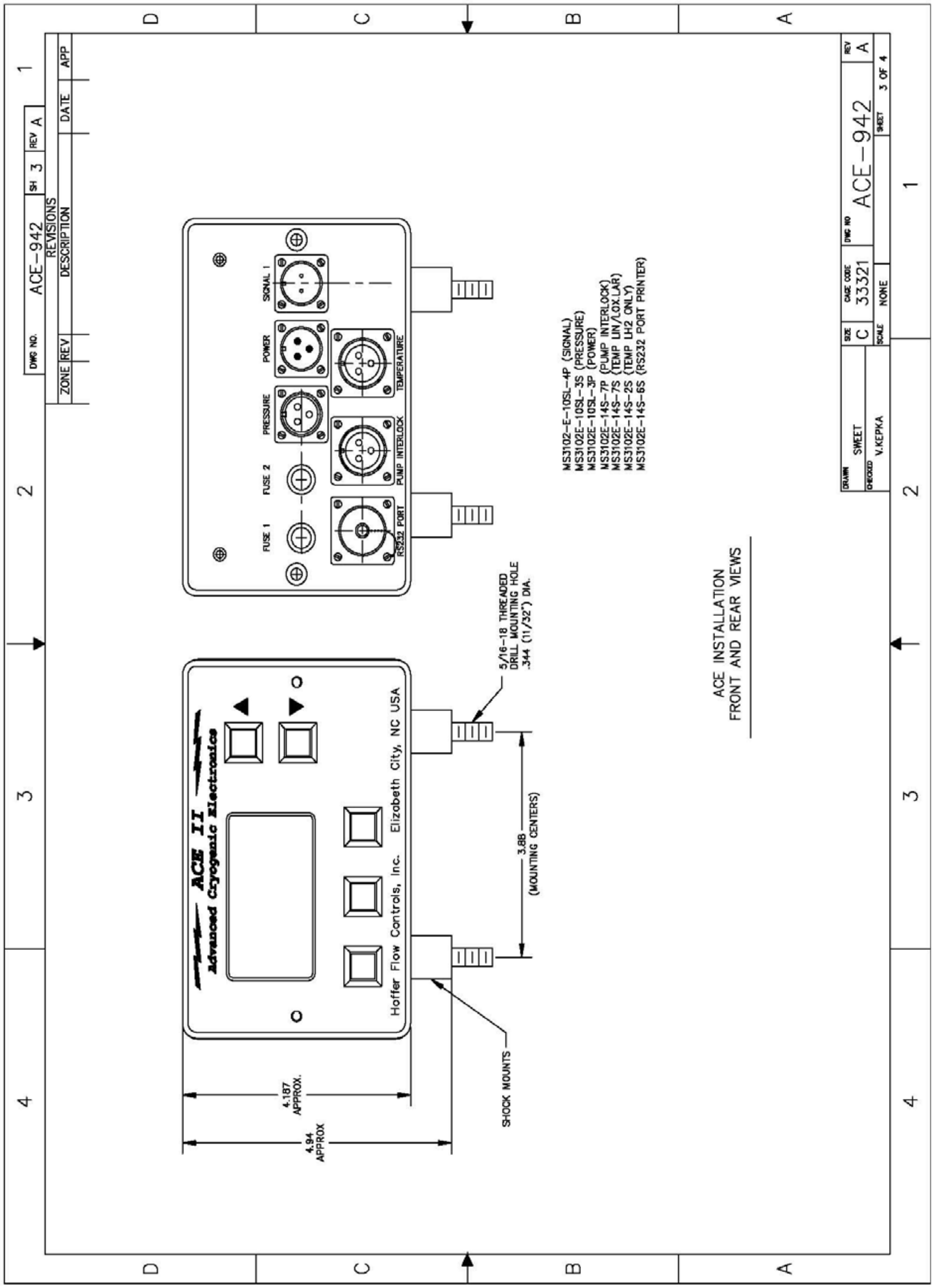
CABLE PART NUMBER	FUNCTION	CABLE WIRE COLOR	CONNECTION TO ACE TERMINAL	ACE DESIGNATORS
SCA-XLU3-P	Power	RED	PWR-(DC+)	+ DC IN
		BLK	PWR-(DC-)	- RETURN
		WHT	PWR-GND	CHASSIS/SHIELD
SCA-XLT2-S	Signal	WHT	TB1-7	SIG 1
		BLK	TB1-6	COM
SCA-XLT2-TA	Temperature Probe	WHT	TB-21	+TEMP SIGNAL
		BLK	TB-20	-TEMP SIGNAL
SCA-XCT4-RS	Serial Port (Printer)	WHT	TB1-13	RX
		GRN	TB1-12	TX
		BLK	TB1-8	COM
		RED	TB1-11	DTR
SCA-XCU2-PI	Pump Interlock	RED	PUMP INLK-IN	-
		BLK	PUMP INLK-OUT	-
SCU-XLT2-PT	Pressure	BLK	TB1-14	PRESSURE IN
		RED	TB1-16	+24V

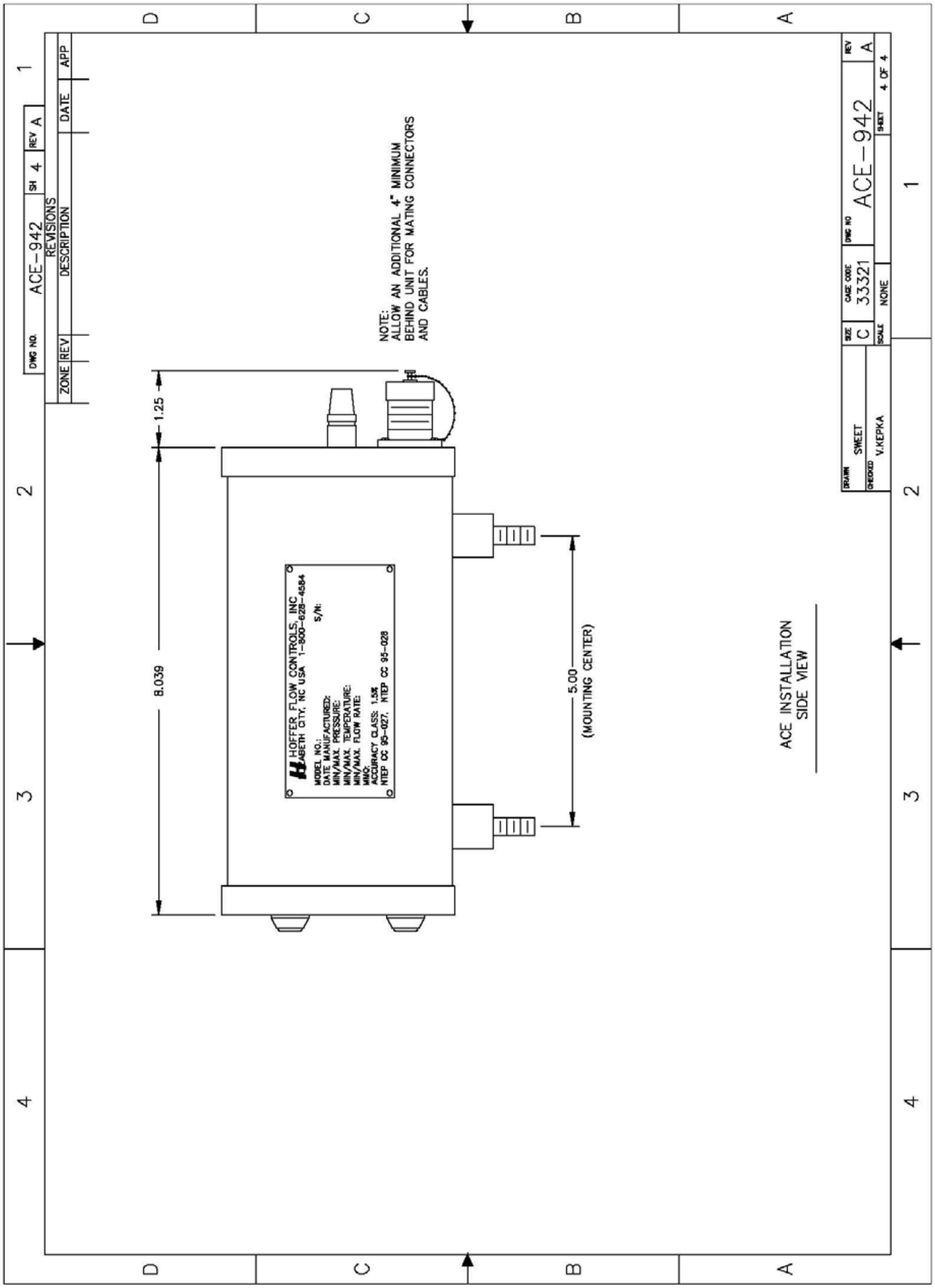

NOTE: CABLE PART NUMBERS SHOWN ARE STANDARD LENGTH.
PART NUMBER WILL VARY IF CUSTOM LENGTH IS SPECIFIED.
DC POWER INPUT
+
-
CHASSIS GRD
RED
BLK
WHT
SCA-4CU3-P
POWER IN
POWER OUT
SCA-6CC4-RS
ACE PRINTER
RS232 PORT
POWER IN
SCA-6CC3-P
ACE
SCA-6CC2-S
SCA-6CC2-TA
TO FLOWMETER
TO TEMP. PROBE
REPLAECES 700-0004
HOFFER FLOW CONTROLS, INC
ELIZABETH CITY, NC 27909
INTERCONNECTING WIRING, PRINTER / ACE
C
33321
ACE-708
C
NONE
1 OF 1
DWG NO. ACE-708 SH 1 REV C
REVISIONS
ZONE REV DESCRIPTION DATE APP
A REDRAWN (DW) 1-21-92
B DRAWING NO. WAS ACE-708. (CS) 950818 JD
C CORRECTED CABLE PART NUMBERS. DRAWING NO. WAS 700-0004 070919
DRAWN DW 1-21-92
CHECK JD 1-21-92
QA HC 1-21-92
PROJ ENG KRH 1-21-92

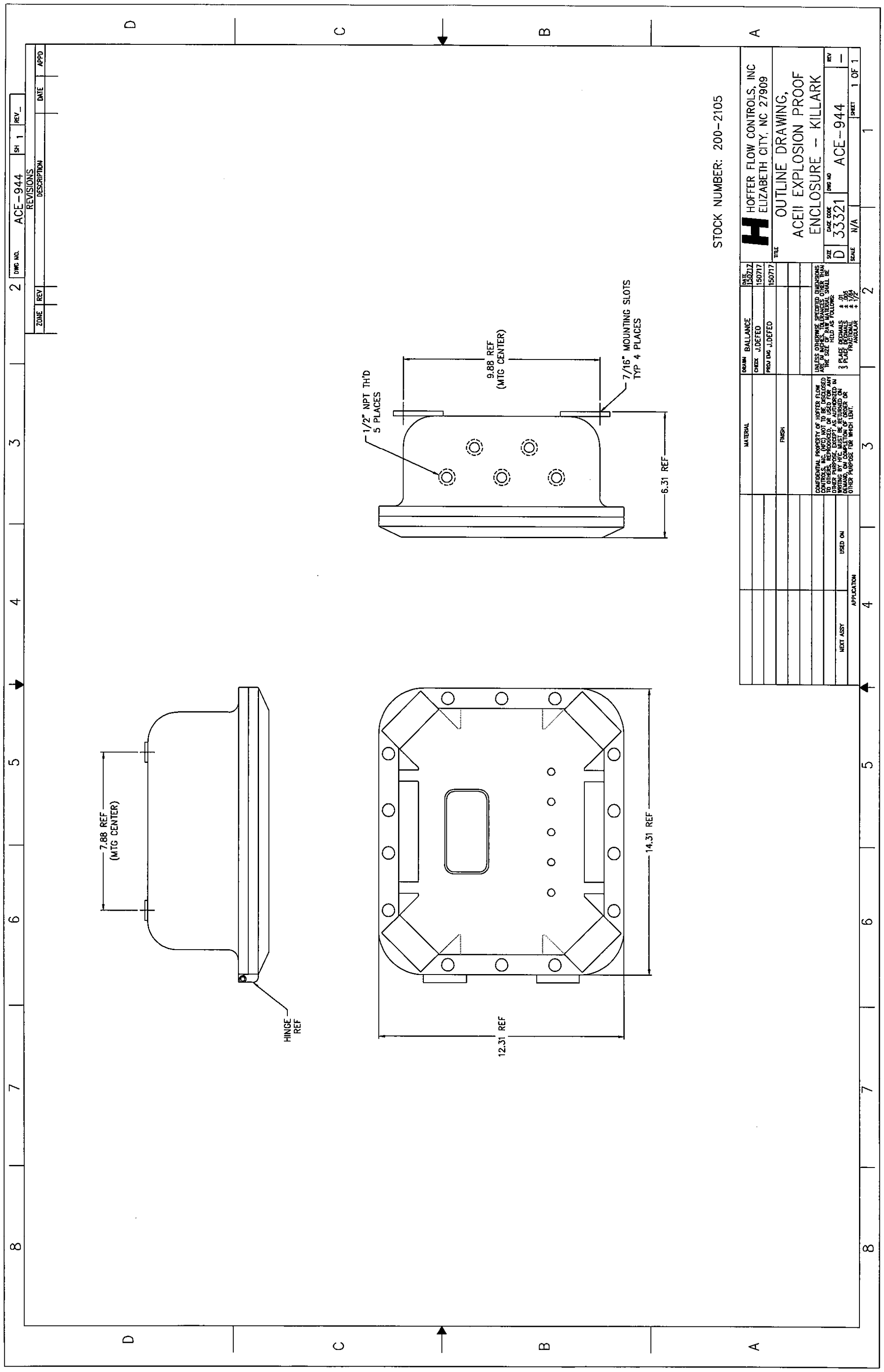

REVISIONS
REV
DESCRIPTION
DATE
APP
F
FOR REV A-E REF REV. E ADDED 2nd CABLE TO SHOW WITHOUT CONNECTOR
100309
JJ
NOTES:
1. SPECIFY CABLE LENGTH WHEN ORDERING.
2. CABLE PART NO. SCA-XC(DB)5-RS
3. USE CABLE TYPE ALPHA 5599/5, 5310 OR EQUAL.
4. PIN 20 ON DB25P W/HOOD WIRED FOR PRINTER BUSY.
CN-
MS3106F-14S-6P
A B C D E F
YEL
BRN
BLK
RED
ORN
RX
TX
COM
DRAIN
DTR
DCD
CN-
DB25P W/HOOD
2 DATA
3 DATA
7 SIGNAL COMMON
1 PROTECTIVE GROUND
20 (PIN ASSIGNMENT APPLICATION DEPENDENT)
8 (PIN ASSIGNMENT APPLICATION DEPENDENT)
5 CONDUCTOR SHIELDED CABLE
NOTE 3
(REPLACES 100-2067)
HOFFER FLOW CONTROLS, INC.
ELIZABETH CITY, NC 27909
TITLE
GENERAL PURPOSE
RS-232 CABLE-
ACE
SIZE A
CAGE CODE 33321
DWG NO SCA-914
REV F
SCALE NONE
SHEET 1 OF 1
MATERIAL
FINISH
DRAWN RLG
CHECK
PRODUCTION
PROJ ENG
DATE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES OTHER THAN THE SIZE OF RAW MATERIAL SHALL BE HELD AS FOLLOWS:
2 PLACE DECIMAL ± .01
3 PLACE DECIMAL ± .005
FRACTIONAL ± 1/64
ANGULAR ± 1/2°
CONFIDENTIAL PROPERTY OF HOFFER FLOW CONTROLS, INC. (HFC) NOT TO BE DISCLOSED TO OTHERS, REPRODUCED, OR USED FOR ANY OTHER PURPOSE, EXCEPT AS AUTHORIZED IN WRITING BY HFC. MUST BE RETURNED ON DEMAND, ON COMPLETION OF ORDER OR OTHER PURPOSE FOR WHICH LENT.
NEXT ASSY
USED ON
APPLICATION


DWG NO. ACE-942 SH 1 REV A
REVISIONS
ZONE | REV | DESCRIPTION | DATE | APP
A | REVISED PER ECP 553, REMOVED IR | 090224 | V.K.
8.54
4.187
6.25 APPROX
7.00 APPROX.
ACE II
Advanced Cryogenic Electronics
Hoffer Flow Controls, Inc. Elizabeth City, NC USA
FUSE 1
FUSE 2
PRESSURE
POWER
SIGNAL 1
RS232 PORT
PUMP INTERLOCK
TEMPERATURE
ALL HARDWARE STAINLESS STEEL.
SHOCK MOUNTS
3.88 (MOUNTING CENTERS)
5/16-18 THREADED DRILL MOUNTING HOLE .344 (11/32") DIA.
UNIT CAN TILT 10° UP OR DOWN – WHEN ORDERING ADVISE UP OR DOWN TILT – IF NOT SPECIFIED DOWN TILT PROVIDED AS STANDARD.
MS3102-E-10SL-4P (SIGNAL)
MS3102E-10SL-3S (PRESSURE)
MS3102E-10SL-3P (POWER)
MS3102E-14S-7P (PUMP INTERLOCK)
MS3102E-14S-7S (TEMP LIN/LOX.LAR)
MS3102E-14S-2S (TEMP LH2 ONLY)
MS3102E-14S-6S (RS232 PORT PRINTER)
MATERIAL
FINISH
NEXT ASSY
USED ON
APPLICATION
DRAWN SWEET 020712
CHECK V.KEPKA 020712
PROJ ENG V.KEPKA 020712
CONFIDENTIAL PROPERTY OF HOFFER FLOW CONTROLS, INC (HFC) NOT TO BE DISCLOSED TO OTHERS, REPRODUCED, OR USED FOR ANY OTHER PURPOSE, EXCEPT AS AUTHORIZED IN WRITING BY HFC. MUST BE RETURNED ON DEMAND, ON COMPLETION OF ORDER OR OTHER PURPOSE FOR WHICH LENT.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES OTHER THAN THE SIZE OF RAW MATERIAL SHALL BE HELD AS FOLLOWS:
2 PLACE DECIMALS ± .01
3 PLACE DECIMALS ± .005
FRACTIONAL ± 1/64
ANGULAR ± 1/2
HOFFER FLOW CONTROLS, INC
ELIZABETH CITY, NC 27909
TITLE
INSTALLATION DRAWING – ACE II
SIZE C
CAGE CODE 33321
DWG NO ACE-942
REV A
SCALE NONE
SHEET 1 OF 4


NOTE:
ALLOW AN ADDITIONAL 4" MINIMUM
BEHIND UNIT FOR MATING CONNECTORS
AND CABLES.
1.25
8.039
5.00
(MOUNTING CENTER)
HOFFER FLOW CONTROLS, INC
ELIZABETH CITY, NC USA 1-800-628-4584
S/N:
MODEL NO:
DATE MANUFACTURED:
MIN/MAX. PRESSURE:
MIN/MAX. TEMPERATURE:
MIN/MAX. FLOW RATE:
MMQ:
ACCURACY CLASS: 1.5%
NTEP CC 95-027, NTEP CC 95-028
ACE INSTALLATION
SIDE VIEW
DWG NO. ACE-942 SH 2 REV A
REVISIONS
ZONE REV DESCRIPTION DATE APP
DRAWN SWEET
CHECKED V.KEPKA
SIZE C
CAGE CODE 33321
DWG NO ACE-942
REV A
SCALE NONE
SHEET 2 OF 4


DWG NO. ACE-942 SH 3 REV A
REVISIONS
ZONE REV DESCRIPTION DATE APP
SIGNAL 1
POWER
PRESSURE
FUSE 2
FUSE 1
TEMPERATURE
PUMP INTERLOCK
RS232 PORT
MS3102-E-10SL-4P (SIGNAL)
MS3102E-10SL-3S (PRESSURE)
MS3102E-10SL-3P (POWER)
MS3102E-14S-7P (PUMP INTERLOCK)
MS3102E-14S-7S (TEMP LIN/LOX,LAR)
MS3102E-14S-2S (TEMP LH2 ONLY)
MS3102E-14S-6S (RS232 PORT PRINTER)
5/16-18 THREADED
DRILL MOUNTING HOLE
.344 (11/32") DIA.
ACE INSTALLATION
FRONT AND REAR VIEWS
ACE II
Advanced Cryogenic Electronics
Hoffer Flow Controls, Inc. Elizabeth City, NC USA
3.88
(MOUNTING CENTERS)
SHOCK MOUNTS
4.187
APPROX.
4.94
APPROX
DRAWN SWEET
CHECKED V.KEPKA
SIZE C
CAGE CODE 33321
DWG NO ACE-942
REV A
SCALE NONE
SHEET 3 OF 4


NOTE:
ALLOW AN ADDITIONAL 4" MINIMUM
BEHIND UNIT FOR MATING CONNECTORS
AND CABLES.
1.25
8.039
5.00
(MOUNTING CENTER)
HOFFER FLOW CONTROLS, INC
ACE INSTALLATION
SIDE VIEW
ACE-942
REVISIONS
ZONE
REV
DESCRIPTION
DATE
APP
SWEET
V.KEPKA
C
33321
NONE
4 OF 4
A


STOCK NUMBER: 200-2105
HOFFER FLOW CONTROLS, INC
ELIZABETH CITY, NC 27909
OUTLINE DRAWING,
ACEII EXPLOSION PROOF
ENCLOSURE – KILLARK
ACE-944
D
33321
N/A
1 OF 1
BALLANCE
J.DEFEO
1/2" NPT TH'D
5 PLACES
9.88 REF
(MTG CENTER)
7/16" MOUNTING SLOTS
TYP 4 PLACES
6.31 REF
7.88 REF
(MTG CENTER)
14.31 REF
12.31 REF
HINGE
REF
REVISIONS

Appendix G: ACEII Weight Scale Calibration Procedure

Turbine flowmeters, when properly used, have been found to be more accurate than most weight scales in determining the amount of product delivered. Whenever possible use Hoffer portable Transfer Standard SY-14B to perform ACE II system calibrations. This procedure requires the use of two tankers. One full of fresh cold product and a empty tanker. Place the full tanker onto the scales. Hook up the piping so that the full tanker will be pumping off to the empty tanker. Follow the steps below:

1. Power up the ACE II unit and enter the MENU.
2. Select BASIC SETTINGS mode. Set DELIVERY UNITS to mass (KG or LB). Set Linearization to AVERAGE K-FACTOR.

2. Record the AVERAGE K-FACTOR value.

3. Return the ACE II to the OPERATING mode.

4. Pressurize and cool down the piping and flowmeter.

5. Press the **CLEAR** key on the ACE II twice to clear the total.

6. Weigh the tanker and record its INITIAL WEIGHT. After weighing the tanker start the pump.

7. To determine the TEST SAMPLE SIZE, divide the scale increment by the accuracy requirement. For example, if scale increment is 10 pounds and the accuracy requirement is 0.5%, then 10 pounds / 0.005 = 2000 pounds. It is best to use an accuracy requirement equal to the linearity rating of the flowmeter (typically 0.5%)

8. Open the discharge valve and allow the tanker on the scales to pump off an amount of fluid equal to the TEST SAMPLE SIZE. After the TEST SAMPLE SIZE is pumped, close the discharge valve. Weigh the tanker again; this is the tanker FINAL WEIGHT. Calculate the SCALE TOTAL by subtracting the FINAL WEIGHT from the INITIAL WEIGHT.

9. Record the DELIVERY TOTAL displayed on the ACE II.

$$AVERAGE_K_FACTOR_{NEW} = \frac{DELIVERY_TOTAL}{SCALE_TOTAL} \times AVERAGE_K_FACTOR_{OLD}$$

11. Use the following equation to calculate the new AVERAGE K-FACTOR:

12. Enter the ACE II CALIBRATION mode and enter the new AVERAGE K-FACTOR

13. Repeat Steps 6 through 9 to verify the new calibration is within the accuracy requirements. If the new calibration is not within the accuracy requirements then repeat Steps 6 through 12.